PERFORMANCE MEASUREMENT, FEEDBACK, AND REWARD PROCESSES IN RESEARCH AND DEVELOPMENT WORK TEAMS: EFFECTS ON PERCEPTIONS OF PERFORMANCE

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Organizations have had difficulty managing the performance of their knowledge work teams. Many of these troubles have been linked to antiquated or inadequate performance management systems along with a scarcity of empirical research on this important human resource initiative. These problems are magnified when managing the performance of research and development teams because greater ambiguity and uncertainty exists in these environments, while projects are unique and continually evolving. In addition, performance management in R&D has only recently been accepted as important while individuals in these settings are often resistant to teams. This study represented the first step in the process of understanding relationships between performance management practices and perceptions of performance in R&D work teams.

Participants were 132 R&D team leaders representing 20 organizations that agreed to complete a survey via the Internet. The survey instrument was designed to examine the relationships between performance measurement, feedback, and reward processes utilized by teams in relation to measures of customer satisfaction, psychological and team effectiveness, and resource utilization and development.

The most important level of performance measurement occurred at the business unit level followed next by the individual level while team level measurement was

unrelated to team performance. A simple measurement system with three to seven performance measures focused on objective results, outcomes, and customer satisfaction appeared ideal. Team participation in the performance management process, most notably the process of setting performance measures, goals, and objectives was also important. The use of multiple raters, frequent performance appraisals, and frequent feedback were identified as meaningful. Specific types of rewards were unrelated to performance although some evidence suggested that business unit rewards were superior to team and individual rewards. It was speculated that R&D teams function more like working groups rather than real teams. The focus in R&D seems to be on business unit projects, products, or designs where the aggregate of individual and team contributions determine larger project outcomes.

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CHAPTER I

INTRODUCTION

Purpose of Paper and Overview

The purpose of this paper is to examine and investigate the performance management processes utilized by research and development (R&D) work teams and their relationship to team leader perceptions of performance. The paper contains five chapters that include the introduction, literature review with the study's rationale and hypotheses, methodology, results, and a discussion section. In the introductory chapter this paper will lead the reader through brief sections on the need for team performance management, the value and naïveté of teams, and team definitions and levels of interdependence. The second chapter contains the review of literature. Discussion will focus on the rationale for team-based performance management processes and the dilemmas of performance management before addressing the conceptual background for performance measurement in team-based organizations. Following this theoretical discussion the paper will shift to the specifics of team-based performance measurement systems that have been cited in the literature. This discussion will include the types or models of team appraisal systems published in the literature. Next the paper will cite the impact and benefits of team performance management systems. This section will be followed by discussions on organizational culture and linkage, levels of measurement, measurement needs, performance goals and goal setting, types of performance measures,

and performance raters. Following this discussion the paper will outline team characteristics that impact both performance and performance measurement. Sections will follow covering team performance feedback, rewards, team effectiveness, knowledge work, research and development, and team development. Chapter two will conclude with the study's rationale and research hypotheses. Chapter three will outline the study's research design, subjects, measures, research procedures, and methods of data analysis. Chapter four will cover the statistical results of the study, and chapter five will discuss the implications of these results, limitations of the study, and directions for future research.

The Need for Team Performance Management

Corporate America has fully embraced teams as a means to compete in a highly competitive, global marketplace. Despite their overwhelming popularity and their potential for dramatically improving performance, many teams disappoint or fail altogether. Many of these failures can be traced to inadequate management of team performance. In spite of a rush to implement and utilize teams over the past decade, surprisingly little is known about how to manage the performance of teams or evaluate their work. There is a considerable gap within literature concerning the proper utilization of performance measurement, feedback, and reward processes that should be used to support teams. Even after more than 50 years of research on teams in the workplace, little empirical work has been done on the performance management processes of teams. Steve Jones (1997) believes this is an area where practice continues to lead theory and research. Corporate America continues to rely upon the "art" of team performance

management rather than "science." While some performance management research has been established with manufacturing teams, there is a scarcity of empirical information for teams involved in knowledge work. The increasing growth and utilization of teams in the research and development (R&D) sector has made this need even more profound.

The Value and Naïveté of Teams

Organizations that have redesigned around work teams report benefits that include: improved individual performance, increased quality, reduced absenteeism, lower turnover rates, decrease in work-in-progress inventory, more efficient plant structures, and sizable improvements in cycle time production (Manz & Sims, 1987; Harris, 1992; Versteeg, 1990, as cited in Scott, Casino, & Bishop, 1996). In the year 2000 it is estimated that 50 percent of the American work force will be members of teams. A University of Southern California survey found that 91 percent of American companies use project teams, and two-thirds of U.S. companies utilize permanent or self-managed teams (Dumaine, 1994). Project teams usually have specific goals so that once the mission or project is complete the team usually disbands. Permanent or self-managed teams engage in day-to-day work. These teams have the authority to make decisions about how daily work gets accomplished. Teams in the work place, whether project-based or permanent, will almost certainly be commonplace in organizations of the future.

A majority of executives are advocates for teamwork. Teamwork represents a set of values that focuses on listening and responding constructively to the views of others. Teamwork seeks to give others the benefit of the doubt, while providing support and recognizing the accomplishments and interests of others (Katzenbach & Smith, 1993b).

Covey (1989) believes that the essence of organizational effectiveness is a balance between production and what he calls production capability or the abilities and assets that produce the desired results. Teamwork and a supportive organizational culture provide the capability necessary to achieve desired production or results. Teamwork values alone are not enough to ensure team performance. A team is not just any group working together. Groups do not become teams simply because someone calls them teams. The label "team" is a platitude used by many companies even if no teamwork or synergy exists. This loose application of the word "team" hinders both the learning and application of the discipline that leads to good performance (Katzenbach & Smith, 1993b).

Despite the popularity of teams and their potential for dramatically increasing productivity, many organizations are naïve about the organizational support systems that must be in place for teams to be successful. Even after some 50 years of research on the subject of teams, there are few principles and specifications available for guiding the origination or management of teams, for differentiating good and poor teams, or for assessing teams (Sweezy, Meltzer, & Salas, 1994). At a glance, the virtues of work teams look obvious. Teams make workers happier, and they give people the feeling that they are governing their own jobs. Teams increase efficiency by eliminating hierarchical management; an organization can utilize the creativity and skills of an entire work force ("The trouble with teams," 1995). However, Ed Lawler states, "People are very naïve about how easy it is to create a team. Teams are the Ferrari's of work design. They're high performance but high maintenance and expensive" (Dumaine, 1994, p.86). Teams

are often implemented in a void with little or no changes in support systems, work design, or training. Because of this, like other management fads, the utilization of teams has begun to produce its own share of disappointments and setbacks. A.T. Kearney, a consulting company, found in a survey that nearly seven out of ten teams fail to produce the desired results ("The trouble with teams," 1995). Self-directed teams require changes in most organizational systems (Hitchcock & Willard, 1995). According to Osterman, "When teams are introduced in combination with other organizational changes, they work. When introduced in isolation, they fail. My gut feeling is most are introduced in isolation" (Dumaine, 1994, p. 86).

Team Definitions and Levels of Interdependence

Teams are substantially distinct from groups of individuals working together. According to Katzenbach and Smith (1993b, p.45), "A team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable." Similarly, Sweezy, Meltzer, and Salas (1994, p. 143) suggest a team is "a distinguishable set of two or more people who interact dynamically, interdependently, and adaptively toward a common and valued goal, objective, or mission; each of whom has been assigned specific roles or functions to perform, and who have a limited life-span membership." Member interdependency is one key element distinguishing teams from groups. The essence of a real team is synergy and sharing. The team is able to produce results that are not possible through the accumulation of individual efforts. The whole is always greater than the sum of the parts. Synergy is only possible where there is trust and a high level of cooperation.

The members of a team value their individual differences and use teamwork to create results not possible through individual efforts. Without a common commitment, groups perform as individuals. With a common purpose, they can become a salient crew of collective performance (Covey, 1989; Katzenbach & Smith, 1993b). Katzenbach and Smith (1993b) also suggest that a common goal or task is a critical element that separates groups from teams and contributes to their purpose and motivation for coordination and cooperation.

Teams can be distinguished from groups of workers through various levels of interdependence. These have been identified as working groups, pseudo teams, potential teams, real teams, and self-directed or high-performance teams (Katzenbach and Smith, 1993a). Working groups involve individuals who get together to share information, best practices, and ideas to help each individual perform his or her job most effectively. They possess no common purpose, goals, or cooperative work products. Assessment usually focuses on following orders from above. Pseudo teams view themselves as teams, but lack an important and necessary goal or purpose. Although needing clarity about purpose, goals, products, and help in creating mutual accountability, potential teams do possess important performance goals and work to increase performance. Real teams incorporate a small number of individuals with complementary skills who commit themselves to a common goal, purpose, and approach to the work. Work continues to be managed by a supervisor serving as a team leader. Their assessment is often focused on teamwork and team performance while holding the members mutually accountable for their results. A self-directed or high-performance team has no immediate supervisor. Coaches can

provide suggestions, guidance, and objectives, but the team makes and implements all decisions together. They are completely interdependent and share mutual responsibility. Assessment focuses on self-evaluation and mirrors mutual accountability. Self-directed teams possess more control of their performance measurement. Unless a team is allowed to measure its own performance, it cannot be defined as self-directed (Zigon, 1996).

CHAPTER II

REVIEW OF LITERATURE

Rationale for Team-Based Performance Management Processes

Most organizations today use teams to compete in a highly complex, turbulent, and uncertain global market that makes managing their performance critical. This environment is most prevalent in organizations that are required to achieve "breakthroughs in a rapidly developing technological arena, and to quickly introduce new high quality products and processes" (Mohrman, Mohrman, & Lawler, 1992). Edwards Deming has stated that systems determine approximately 80 percent of performance, not individual skills or effort. He indicates this is even more noticeable in team-based settings where members are defined as interdependent (Hitchcock & Willard, 1995). In these organizations where the work is undoubtedly complex, interdependent, and even ambiguous, the traditional vertically oriented systems must be supplemented by other approaches. This means relying primarily on lateral alignment approaches to complement vertically oriented systems. Most organizations were developed around human resource initiatives that support hierarchic and analytic approaches. Far less of the focus in these organizations has been centered on performance management processes that support the development of lateral, team-based processes. Today's complex problem solving and rigorous performance ventures require flatter organizations that rely heavily

on teams. Thus, performance management systems need to be in place to support these new organizational designs (Mohrman, et. al, 1992). According to Shaw and Schneier (1995), many companies in America struggle with how to measure and reward team performance, and relatively few are content with their current methods for doing so. In addition, in a survey of 4,500 teams in 500 organizations, Norman and Zawacki (1991) discovered that only 10 to 20 percent consider team-related issues in their performance measurement systems.

Many authors and researchers agree that standard, hierarchical systems are especially deleterious to teams (Harrington-Mackin, 1994; Hitchcock & Willard, 1995; Lawler, 1994, 1996; Levy & Steelman, 1996; Meyer, 1994; Mohrman, et. al., 1992; "The trouble with teams," 1995; Mohrman, 1990). Experts universally agree that traditional performance measurement systems that focus on individuals undermine teamwork and create conflict (Mohrman et. al, 1992; Harrington-Mackin, 1994; Lawler, 1994; Meyer, 1994; Hitchcock & Willard, 1995). Mistakes in performance management are detrimental because they send potentially dangerous, mixed signals to the team. While workers are expected to cooperate, coordinate, and pull together, they are appraised on their individual performance and must compete for individual rewards. The most common mistake an organization makes is the failure to launch a satisfactory team performance measurement system despite its acknowledgement of the need for teamwork. According to Meyer (1994), executives realize that dramatic improvement in products and services are possible with process-focused, multifunctional teams.

However, he states that most do not realize that teams need new performance measurement systems to fulfill their potential.

According to Cohen (1994), team performance is one of three significant dimensions of overall team effectiveness, and team performance measurement is a critical means that contributes to creating effective teams (Katzenbach & Smith, 1993b). It is impossible to understand the effectiveness of teams without knowing how the team performs. Measurement provides the necessary data that highlights how a team is doing. Measuring team performance provides a sense of progress and provides feedback about what is and is not working. The lack of a team measurement system is like driving a car without a dashboard. It could be done, but the driver would have very little information on how he or she is doing or if they will suddenly lack an important resource (Meyer, 1994). A good, simple, guidance system enables a team to measure its progress, and this is a necessity for new teams still trying to prove their worth to skeptical management. Organizations that measure performance on certain dimensions before they re-design around teams will see clearly the impact teams will have on overall organizational effectiveness (Richardson, 1995).

Using a team approach to managing performance is likely difficult for many individuals in America to accept. Team performance measurement is strongly opposed to the manager driven, pay-for-performance, individual recognition culture that exists in most American companies (Lawler, 1994). Managers have traditionally been instructed to focus on individual performance. This behavior often results in poor teamwork. It usually encourages people to compete against each another, thus damaging the

performance of the team (Hitchcock & Willard, 1995). Therefore, measuring team performance and individual performance within the context of a team culture requires a substantial shift by the organization. A significant transformation in the performance measurement system is required to meet the needs of an organization designed around work teams. Despite the popularity of teams and the substantial literature that has been written, most organizations still have individual performance measurement systems and individual merit pay compensation systems. Although these individual-based systems fit the experiences and values of most managers, these organizational practices conflict instantly with the development of highly effective teams. Moreover, merely measuring an individual's assistance to the team in a traditional performance measurement system is not nearly enough. What is required is an entire system redesigned for managing performance that endorses the intricacies of teamwork (Lawler, 1994).

Mohrman, Mohrman, and Lawler (1992) found in their work with many organizations that techniques for managing team performance are not well developed. They believe that the management of team performance is in opposition with not only the prevalent, individual performance management systems, but also clearly in opposition with the assumptions made about design, measurement, and control of work. These authors conducted research on three organizations to determine how performance measurement practices affect successful performance. Their main interest was the contributions to effective organizational performance of both individual and group performance measurement practices. The only effects discovered for individual performance practices were employees' perceptions of pay equity and trust. Paying for

individual performance produced no consistent effect on either group or individual measures of performance. These organizations used team self-appraisal as their primary tool for team-based performance measurement. This practice showed a universal effect on all the process variables that include both team and supervisor. It also affected teamwork and understanding the role in the group, as well as team and project effectiveness.

These relationships cited by Mohrman et al. (1992) lead to the direct questioning of traditional performance measurement practices. These authors state, "Where interdependence is high, the old individually oriented approaches offer little leverage on performance" (Mohrman et al., 1992, p. 7). Pay for individual performance does not directly influence either individual or team performance. This research demonstrates the inadequacy of traditional performance measurement systems. None of the effective practices cited relied on the supervisor. The team is clearly the dominant player due to its great influence on performance. Based on this study, pay for individual performance appears to be a way to satisfy individual needs for impartial treatment by the organization. The implication clearly suggests organizations desperately need to develop methods for managing team performance, just as they previously have done for individuals. Trying to affect the team's performance by focusing on individual performance is futile and saturates the team in competition that directly opposes the achievement of team performance. Furthermore, Mohrman, Mohrman, and Lawler also discovered that measurement and reward practices commonly lag behind the design of

teams. They believe the difficulties with measuring teamwork prevent many organizations from attempting to systematically manage the performance of their teams.

Hitchcock and Willard (1995) concur; they believe the first organizational support system that forms a barrier to team performance is the process of managing performance. Typical mistakes include the failure to set clear objectives or goals for the team, inappropriate performance measures, and introduction of teams without changing the organization's framework to a more collective one for appraising performance and rewarding people ("The trouble with teams," 1995; Hitchcock & Willard, 1995). A failure on the part of the organization to change to a flatter, team-based design and measurement system will lead to ineffective outcomes or more likely counterproductive outcomes for the teams. Moreover, after an organization adopts a team approach, it must be willing and capable of proving the team's worth to skeptics in management. Management must see that the power handed over to teams will be advantageous. Without an effective team-based measurement approach, it is impossible. Relying on traditional measures will cause team members to forget the team's goals and regress to old functional ways of measurement or, most likely, conflict with one another (Meyer, 1994).

The Dilemmas of Performance Management

Performance measurement has been one of the most adulated, criticized, and controversial management practices for many years (Lawler, 1994). According to Mohrman and Mohrman (1994), performance management is the set of processes that must be done so that an organization knows that what people do and work at will lead to

the desired results the organization needs. Performance measurement is a means by which individuals and team members are able to focus on how they are performing their job responsibilities (McHale-Calabres, 1995). Measurement is a critical step in the total performance management process. Performance management represents the broader picture that goes beyond pure measurement or assessment. It includes organizational strategies tied to goal-setting, assessment, feedback, and compensation. Performance measurement represents one piece of the overall performance management puzzle and is critical for successful performance if managed appropriately.

In spite of frequently cited problems with traditional, standard performance measurement systems, most companies continue to rely upon them so this practice continues to be vital to organizations. Research at the Center for Effective Organizations suggests that performance appraisal represents the key element in the overall human resource management of an organization (Mohrman, 1990). The judgments of performance appraisal represent the very core of management processes. Appraisals provide pertinent information that is used for development, planning, compensation, and regulative purposes. The objectives of the majority of performance measurement systems are multiple. Most seek improved performance, improved motivation, job clarification, improved communication between workers and management, skill development, and an ability to provide workers with a general sense of the organization's overall direction and vision. However, these multiple objectives often reflect "lofty goals," and the reality of most performance measurement systems can be considered disappointing (Lawler, 1996).

Few management practices are as universally utilized and scorned as the yearly performance analysis. Employees and management agree that this yearly ritual does little to increase performance, and people are usually apprehensive and distressed. Instead of increasing performance, the appraisal usually increases anxiety and puts substantial strain on superior-subordinate relationships. Rarely is an organization satisfied with its current performance measurement or appraisal system (Salas, 1995; Lawler, 1996). Edwards Deming, the Total Quality Management guru, says, "The annual review of people is a major culprit generating fear and wreaking havoc in our corporations and on our people. Companies suffer untold loss because of the annual review. People emerge from their reviews shaken and destroyed, unable to function properly for months" (Harrington-Mackin, 1994, p. 12). In addition, Harrington-Mackin (1994) cites numerous problems with traditional performance evaluation systems. These include standards and ratings that tend to vary considerably and usually unfairly, unclear standards, and employees who often cannot explain the reasons behind their ratings. Also, managers usually give average ratings to poor performers rather than citing difficulties, and they are apt to give higher ratings to those employees they like. Furthermore, ratings often reflect the manager's general impressions rather than specific performance, as well as the propensity to recall behavior that fits the stereotype they possess about an employee. Finally, managers who serve as evaluators are often perplexed about their function as a judge or coach.

Due to poor performance measurement systems, employee motivation often diminishes rather than intensifies, as management would like. As a repercussion,

performance is often lower while creating discontentment in the person being appraised. This association often leads to turnover (Lawler, 1996). Lawler (1992, as cited in Lawler, 1996) has collected data on employee satisfaction with performance appraisal, and almost without qualifiers, the individuals being appraised report lower levels of satisfaction with the episode. Lawler stresses that performance appraisal systems also squander great amounts of precious organizational time. Furthermore, given the velocity at which organizations seem to be relinquishing their old performance measurement systems in favor of newer designs, it seems reasonable to conclude that in a majority of cases the systems fail to accomplish the towering goals and objectives that are set for them. These failures do not seem to prevent organizations from doing performance measurement. Practically every time there is a major initiative for increased production, organizations recreate their pledge to improve their performance measurement system.

Because appraisals involve human behavior and emotions and cannot be completely programmed and regulated, performance measurement is difficult. It is an intrinsically subjective process where an individual is supposed to judge the performance of an employee in a meaningful area for both individuals. According to Lawler (1996, p. 2), "Appraisals are done by human beings, most of whom are not experts in giving and receiving feedback. Indeed, particularly in high-technology and knowledge work organizations, many of them have their expertise in technical areas that stress the very antithesis of the kind of subjective measurement process inherent in performance appraisals." Therefore, there is a penchant for resisting appraisal altogether and, if they cannot be avoided, to get them done as quickly as possible. Performance appraisals

represent a test of power between two individuals, and because this system is tied to other complex purposes by most organizations, the appraiser and the employee often end up with very different agendas (Lawler, 1996).

A Conceptual Background for Team Performance Measurement

When teams disappoint, the problem can usually be traced to a failure in organizational support systems. The major culprit is often the inadequate system for managing team performance (Jones, 1997). This has become an increasingly abundant problem as the number of organizations transitioning to teams continues to rise. Despite this growing utilization of work teams and the potential for drastically increasing quality and productivity, most organizations are hampered by ineffective means of managing team performance. From both applied and scientific perspectives, the field of team performance measurement has been significantly handicapped by a lack of theory development (Jones, 1997). Jones (1997, p. 116) states, "Team performance measurement is an area in which practice has greatly outstripped theory." Practitioners need a conceptual background from which to make decisions about potential measures. The lack of well-developed theoretical models guiding team performance measurement is troubling and can be partially blamed for the inadequacies and failures of a large number of team performance measurement systems within organizations.

Some strong conceptual models are needed to design effective measurement systems and accurately manage team performance. Steve Jones explores theoretical models of organizational effectiveness theory and applies these constructs to team performance measurement in a way that brings clarification and substance to the

fledgling field of team performance measurement. Organizational Effectiveness theory is a body of work that is most closely associated with team performance measurement, and although this field of knowledge is no longer in use it provides a valuable, in-depth theoretical base so that conceptual models of team performance measurement can emerge (Jones, 1997).

The most appropriate models from Organizational Effectiveness theory are the Goal model, Natural Systems model, and the Multiple Constituents model because they have been well developed and widely used (Seashore, 1983). Using the Goal model, a team must satisfy not only its goals but also the goals of the organization to be effective. There is a focus on important outputs, and effectiveness from this model is the progress toward defined goals. These important outputs include productivity, quality, profits, sales, customers served, and items returned. The underlying premise of the Goal model is a set of goals that can be arrived at by individuals, teams, and management (Jones, 1997). To be effective, the team must fulfill agreed upon goals.

The Natural Systems model arose because of challenges made to the Goal model. The concept of agreed upon goals could be attacked by pointing to the preponderance of conflicting goals within organizations (Campbell, 1977). The Natural Systems model uses Open Systems theory as the basis of its premise; like living organisms, organizations and teams have a primary goal to survive and thrive (Baker, 1973). Toward its goal to survive and thrive, a team is often faced with issues of system boundaries. They must manage effectively the interfaces between them, their environment, and the larger organization. The team must also work on self-maintaining processes to survive and

thrive (Jones, 1997). The principal concern here is on "people processes," according to Campbell (1977). Process measures might include trust, inclusion, commitment, and loyalty (Kinlaw, 1991) while boundary measures often include adaptability, flexibility, and openness (Scott, 1977). While the Goal model focuses on measurable outputs, the Natural Systems model concentrates on process variables.

According to Jones (1997), both the Goal model and the Natural Systems model suggest only one perspective regarding a team's effectiveness. He points out that high performing teams seek to meet not only their own goals but also those of their customers, management, and other constituents. The Multiple Constituents model suggests that the unique perspectives of the team's constituents must be accounted for in the measurement of team performance. Different constituent groups use different measures in evaluating performance, and the team must meet the expectations of each. These different perspectives and expectations are seen as an integrated model that encompasses the other models outlined in organizational effectiveness theory (Seashore, 1983). Seashore suggests that these three models should be viewed as complementary, which enhances the richness of organizational effectiveness theory. The blend of the Goal, Natural Systems, and Multiple Constituents models seems most befitting as a theoretical framework for the measurement of team performance (Jones, 1997). In addition, models of team performance or team effectiveness have been delineated which focus on team performance in most cases while corresponding with the three models of organizational effectiveness (McIntyre & Salas, 1995; Hackman, 1987; Gladstein, 1984; Sundstrom, De Meuse, & Futrell, 19990; Nieva, Fleishman, & Rieck, 1978). Included are two

dimensions of team development according to McIntyre and Salas (1995). Taskwork corresponds with the Goal model because it includes relevant operations activities performed by members of the team. Teamwork includes the activities that build the working interactions, relationships, and communication of the team. This dimension is tied most closely with the Natural Systems model.

The models by Hackman, Gladstein, and Sundstrom, De Meuse, and Futrell correspond to all three of the major theories of organizational effectiveness previously outlined (Jones, 1997). Hackman (1987) proposes three guidelines for assessing team effectiveness. These three criteria include the output of the team, the state of the team, and the impact of the team on individual members. The productive output of the team should meet or exceed the standards of those who receive the output, while the social processes utilized during the work should maintain or increase the ability of team members to work together on future tasks. Hackman's third criterion maintains that the team should satisfy rather than discourage or obstruct the individual needs of team members. Gladstein (1984) also proposed a model that defines team effectiveness by three criteria. He identified these as group performance, satisfaction of group-member needs, and the ability of the group to exist over time. Sundstrom, De Meuse, and Futrell (1990) conceptualized team performance as a combination of performance and viability. Performance reflects the definition of the Goal and Multiple Constituents models, while viability includes member satisfaction and the team's future outlook and corresponds nicely with the Natural Systems model (Jones, 1997).

Rather than focusing on outcomes, a taxonomy proposed by Nieva, Fleishman, and Rieck (1978) concentrates on behaviors. These researchers and authors differentiate between individual task performance and team performance functions. Individual task performance includes specific job behaviors, while team performance functions are comprised of the interaction behaviors amongst team members. This taxonomy is most similar to the Natural Systems model because of its focus on interactive team processes (Jones, 1997). This model does not address multiple constituents, but addresses goals through categorizing and communicating team goals, not through the accomplishment of goals.

Jones (1997) suggests, as a result of the parallels between organizational effectiveness and team performance theory, the application to team performance measurement occurs through the choice of specific measures of team performance and through the synthesis of the measurement system. The selection of specific team performance measures occurs according to the team's arrangement. A team driven by its goals or the goals of the larger organization will use measures compatible with the Goal model. A team concerned with human processes, boundaries, or viability will use measures compatible with the Natural Systems model. A team that is held accountable by customers, management, other teams, and other constituents will utilize measures consistent with the Multiple Constituents model. In fact, most teams will utilize some combination of these three models in balance with their orientation.

The integration of organizational effectiveness theories and team performance has been delineated in a model constructed by Jones (1997). This model represents a well-

developed understanding of the measurement realm of team performance. It depicts the processes used in developing a team performance measurement system. The model represents points of understanding and the decisions inherent in the construction of the actual measurement system. This entire operation occurs in the midst of management, customer, and team participation. Inputs of these different groups are optimally outlined in a joint meeting of all constituents. The best outcomes occur in the midst of direct contact between the perspectives of team members, customers, and management. Jones points out that it is critical to understand that the organization's culture and the needs of customers set up the preliminary context for the entire measurement system. The culture will greatly influence the model or models of organizational effectiveness utilized whereas the understanding of customer needs helps the team think outside its own internal preferences.

A complete understanding of the organization's goals, strategic plan, and team mission provides the context within which the measurement system is constructed. This information is the foundation of the measurement system because it aligns the team measurement system with the organizational strategy. Comprehending the goals helps the team see what is important to the organization while the strategic plan includes the vision and both short-term and long-range plans. A complete understanding of the strategic plan shows the team how the goals will be achieved. The team's mission mirrors the team's duty in achieving the strategic plan. Whenever this complete understanding is achieved, the most appropriate model or blend of organizational

effectiveness models can be resolved and put to use as a conceptual direction for the construction of the measurement system (Jones, 1997).

Jones adds two final components to the model, including benchmarking. Benchmarking is a term used to improve the processes of a team by employing what the most successful or high performing teams do. Benchmarking implies that teams can look at the measures utilized by similar teams and employ the measures and performance levels used by the high performing teams. Jones views benchmarking as similar to the customer needs component because it successfully expands the team's viewpoint beyond itself and pushes them out of a measure of comfort.

The last component of the team measurement model is adapted from the theory of constraints. The theory of constraints is an extraction of systems theory as it is applied to the problems in the field of production and operations management (Gardiner, Blackstone, & Gardiner, 1994). It is easily applicable to any organization or team with inputs, throughputs, and outputs. Each of the inputs has variations and is pictured as a wave. The throughputs are interconnected, and each also produces transitional outputs that then become inputs for later throughputs. These transitional outputs also have variability. The constraints will occur where the variability of inputs surpasses the capacity of the system to operate or process those inputs, producing a bottleneck. Because of the joining of interconnection and variability, a constraint will obstruct or delay throughputs throughout the system. Constraints are most typically described as a long sequence of work or long processing times. The theory suggests that the greatest

constraint in the system should be improved rather than attempting concurrent efforts to improve each aspect of the process (Jones, 1997).

Jones also indicates that a great challenge in team measurement is to capture the important facets of team performance with the fewest number of measures. A cumbersome measurement system can become an administrative obstacle to improving team performance. He suggests that the most common means to keep the number of measures at a critical few is to use output measures rather than process measures. However, some process measures are most likely necessary. In concordance with the theory of constraints, it is suggested that measures be selected for their ability to focus the team on the most dangerous constraint. Undertaking a measure for the most critical constraint can keep the number of process measures at a vital few. A team can look at a constraint as a logjam. Once the team has removed that logjam, its work processes will pass more smoothly. A team can target a constrained work process by giving that critical constraint the highest priority at the moment. As a team focuses its energy on removing that critical constraint, the team may make a momentous breakthrough in its performance. The removal of the greatest constraint will often significantly improve system performance and lead to the unearthing of yet another constraint (Jones, 1997). As the model of team measurement incorporates the concepts of benchmarking and the theory of constraints, a more accurate model is revealed. This complete model, according to Jones, culminates in the performance measurement system. The system embodies dimensions of team performance, measures of those specific dimensions, and a device that synthesizes all the measures into a composite.

While it is important to bring theory to the development of a conceptual framework for team performance measurement, it is also important to discuss the issue of suboptimization. According to Jones (1997, p. 134), "suboptimization refers to an improvement in a subsystem that does not translate into an improvement in the larger system." To prevent organizational suboptimization, a team's performance measurement system must include management input and review during the system's developmental stages. Well-developed team performance measurement systems align with organizational or business strategy that occurs through the involvement of top management. Top management is responsible for ensuring that the team's measurement system flows from business strategy.

Jones outlines theoretical perspectives from organizational effectiveness, the theory of constraints, benchmarking, and suboptimization that are applicable to a conceptual framework for team performance measurement. The specific model of measurement depends upon the arrangement of the organization. It is likely that some teams may utilize measures from all three models to accurately fit their arrangement. The Goal, Multiple Constituents, and Natural Systems models provide a conceptual understanding so that predictable patterns can be differentiated from the multitude of team measurement endeavors. Jones proposes that the arrangement or the choice of the organization of one of the three models will be tied to its choice of team measures. A lack of congruence between the business strategy and the team measures will result in failure or modification of the measurement system or business strategy.

Jones observes that the theory of constraints is relevant because it points the measurement system toward the enhancement of the team's success. It is suggested that improvement efforts be targeted at the greatest constraint to remove the "logjam." Most of these constraints are psychological in nature. They emanate from poor choices that have resulted in out-dated policies and procedures, a retreat from identified deficiencies and destructive norms. He suggests that teams utilizing the theory of constraints will see significant improvement in their overall performance. He also acknowledges that once a constraint is extracted, a new constraint will become visible. Finally, new constraints will become more formidable to alleviate than the past constraints.

Suboptimization is also preventable according to Jones (1997). When the team's performance measurement system flows from the organization's vision or strategy, suboptimization is thwarted. Through the developmental process of creating the team measurement system and the involvement of top management, team members are able to accurately understand the organizational goals and short-term and long-term plans. Those who have not clearly spelled out their vision and strategic plans will suffer immeasurably when they attempt to design their team performance measurement system. It was proposed that suboptimization at the organizational level will lead to the development of a system that lacks a comprehensive understanding of the organization's strategic plan. Furthermore, a failure to clarify and obtain the commitment of individual team members to the strategy or vision will lead to suboptimization at the team level.

Team-Based Performance Management Systems: General Issues

Although it has been well documented that traditional appraisal systems are detrimental to teams, considerably less is known about team-based performance appraisal. While a few studies have shown that measurement systems result in an improvement in team performance (Pritchard et al., 1988; Jones et al., 1993; Jones, Powell, & Roberts, 1990), there remains a significant lack of empirical work on team performance appraisal (Levy & Steelman, 1996). "A team performance measurement and feedback system is defined as a family of measures that tracks how well the team is accomplishing its strategy. Feedback refers to the regular and ongoing data received from the team's measurement system to promote problem solving and continuous improvement" (Jones & Moffett, p. 158). Despite the lack of empirical verification, many have proposed methods and means that must be accounted for in a team performance appraisal process. Tom Malone of Milliken and Company acknowledged, "Teams that don't keep score are only practicing" (Hronec, 1993, p. 37; as cited in Hitchcock & Willard, 1995). Meyer (1994, p. 96) agrees by asserting, "Trying to run a team without a good, simple guidance system is like trying to drive a car without a dashboard." In a team-based setting, performance measurement empowers team members to take charge and monitor their own performance with little or no assistance from supervisors. Team members need to know how they are doing based on their performance goals. If the team does not possess the necessary information on their performance, they are unable to know how to improve future performance. Continuous improvement is the key to maintaining an effective work environment. Through

performance measurement team members can track their own progress toward goals on a continual basis and gain immediate feedback.

Jones and Moffett (1999) discuss four key issues in designing effective performance measurement systems for teams. The first key is alignment. There must be a natural linkage between team measurement and organizational strategy. A clear connection between the team's strategy and organization's strategy is paramount. Teams should carefully look for ways to link their strategy and their measures to the larger organizational strategy. To ensure linkage, top management needs to articulate the organizational strategy well and transmit this information in a meaningful way for its teams. Individual team members should illustrate their in-depth understanding of the organizational strategy or what Jones and Moffett call "business literacy." The link between organizational strategy, team strategy, and team performance measurement is the most important variable in team implementation.

The second key issue addresses customers' needs by involving them in the measurement process. While it is critical to understand organizational strategy, a team must also have a comprehensive understanding of customer necessities. What happens all too often is a division between teams and their customers that consummates with measures being internally motivated, rather than customer-driven. To avoid this occurrence, teams are empowered to collaborate with their customers before and during the process of team measurement development.

The third issue discussed by Jones and Moffett when designing team measurement systems is "buy-in." This ownership occurs when teams participate in the

development of the measurement system. Team performance measurement is a collaborative effort for two reasons. First, team members must take dominion over their measures to magnify their performance on them. A good test of this proprietorship is to see if individual members would defend those measures against the threat of losing them. Second, the purpose of having a measurement system is for the teams to resolve difficulties. Problem solving must involve collaboration. Jones and Moffett want teams to participate in developing their own measurement systems so that these systems differ from one team to another. While the amount of team participation required during measurement system development is unknown, it is critical nonetheless. This participation takes time, the majority of which is spent in meetings. This time must be balanced against business demands. Teams do not have to participate in every decision that is made about system development. Jones and Moffett suggest that teams should participate in at least some of these decisions in order to enact ownership. This participation can come in many forms so that even minor modifications to the performance measurement system can lead to meaningful "buy-in" by teams. The most important area for participation is determining team goals and strategy. When top management allows or encourages variations on measurement, they later garner the benefits of "buy-in" from the teams. The greater the participation, the less the system is perceived as a mechanism of authoritarian control. "Buy-in" is also needed from key constituent groups in the organization as well as from management. The result is a healthy exchange between management and teams that averts the appropriation of measures that people do not believe in.

The final key issue in performance measurement as discussed by Jones and Moffett (1999) is feedback. (This aspect of team performance management will be covered in greater depth in another section of the paper.) Performance feedback encourages problem solving and continuous improvement. The data from a team measurement system produces critical feedback about how the team is performing and serves as an instrument to improve team performance. Depending on how it is used, performance feedback has either a positive or negative impact on the motivation of team members and the processes of problem solving.

Other important considerations for team-based organizations doing performance measurement are the needs of parallel or project teams. The majority of organizations do not require any measures for teams if their work is short-term. Their achievement may be judged by single measures such as cost or number of project goals met. However, the number of project goals accomplished may not be useful if these are hypotheses rather than specific performance standards. The outcome measure approach for project teams also provides data near the end so that it does little to improve team efforts. Some teams use process measures in addition to outcome measures to alleviate this problem.

Often parallel or project teams work on projects that are outside of traditional departments with both external and internal customers. The key to developing outcome and process measures for these teams is considering three important perspectives: the customer, management, and the team itself. A family of measures produced from these three vantage points gives project or parallel teams the data they need to make

modifications. This approach may also present top management with the data needed to stay up-to-date about the project's status.

Published Team Performance Measurement Systems

There are five major types of performance measurement systems cited in the literature and presented at conferences, according to Jones and Moffett (1999). ProMES (Productivity Measurement and Enhancement System) for Teams is a measurement approach based on Pritchard's work in the early 1980s and later modified by Steve Jones as a family of measures. This approach analyzes multiple measures and blends them into a composite index. ProMes for Teams has three primary objectives. First, decide upon the right measures. This is accomplished by joining the team measurement system to the needs of the customer and the organization's overall strategy. Second, involve the team in developing the measurement system in order to create buy-in. Third, make the measurement system adaptable (Jones & Moffett, 1999).

Six steps make up the ProMes for Teams approach to measurement. First, the team develops an accurate understanding of the organizational strategy and customer requirements. Often, the process of developing the system provides a chance to focus on customer needs and the organization's strategy. This process helps establish the appropriate context for the team to develop the measurement system. It is crucial that the teams view the measurement system as a mechanism for forming and then executing their strategic plan, rather than as a means for command and control. Second, the team determines the dimensions of its own performance. These are the critical areas in which a team must perform well in order to be successful. These dimensions provide a road

map of the work area that often includes productivity, cost control, quality, customer service, sales, and teamwork. The final set of dimensions includes a blend of the critical areas of team performance as viewed by customers, top management, and the team. The third step involves weighting the dimensions for importance. One or more measures are established for each dimension as the fourth step. This is often a selection of items from a list of possible measures furnished by top management or a committee. Fifth, if there is only one measure per dimension, this dimension weight becomes the importance weight for exclusive measure within that dimension. The sixth and final step entails synthesizing the measures and importance weights into a composite index. Through a consultation process, top management and team members determine the best outcome, worst outcome, and minimal expectations for each measure (Jones & Moffett, 1999).

Schilling and Valera (1994; as cited in Jones & Moffett, 1999) have developed the Team Scorecard that fits well with production teams. It determines how an organization's strategy is transformed into measurable outcomes for a team. Usually, a team scorecard is made up of five to ten specific measures. The present performance on each measure is compared to a year-to-date average, previous year's average, short-term and long-term goals, and minimum and maximum merits. The differences between present performance and team goals present challenges for improvement. The team selects the most important deficit for improvement, while continuing to preserve its performance on the other measures of the scorecard.

Riggs and Felix (1973, as cited in Jones and Moffett, 1999) illustrated the Objectives Matrix. Also known as the Omax or Oregon Matrix, this has been widely

used to synthesize a family of measures into a single composite score. Recently, Heninger (1994, as cited in Jones and Moffett, 1999) updated this system where teams weight each measure for importance so that they total to 100. The team then sets a percentage of goal levels for each measure so that the baseline performance receives zero percent and the long-term goal level equals 100 percent. This process yields a composite score that could reach 100 percent, but more often is in the teens.

The Zigon Performance Group led by Jack Zigon (1997; 1998) produced a team performance measurement system that fits a variety of work situations and is well suited for hard-to-measure situations that are typical of knowledge work settings such as research and development. Zigon's variable approach uses different methods depending on the team's alignment with the outcomes of the organization. One method, the team customer diagram, is used when customer satisfaction is the number one priority. The team accomplishment pyramid identifies expectations at the organizational level and divides these into expected team results. The work process flow is utilized when a team must support a specific work process. Based on these methods, team accomplishments are distinguished and weighted for importance on a 100 percent scale. This is followed by a step where measures are determined and performance goals are established for each measure. Then team performance is followed on each measure in relation to these standards. Zigon also produced individual accomplishments that are not charted by the team measures. The feedback report from this method contains not only performance on each of the team measures but may also offer a report for each individual team member. This approach is especially well suited for teams that have a large proportion of

individual accomplishments. These teams most often consist of knowledge workers in sales, research and development, and scientists where their performance has proven especially difficult to measure. A combined measurement system of team and individual accomplishments is often laborious. Each person on the team, in addition to the team itself, has data to be collected and a feedback report.

Kaplan and Norton introduced the Balanced Scorecard, which is built upon the concept of cause-and-effect. It augments monetary-driven measures at the top management level with specific measures appealing to customer needs, internal organizational processes, and learning and invention. Kaplan and Norton's Balanced Scorecard depicts two critical principles of measurement -- balanced perspectives and causal alignment to organizational strategy. An appropriate balance between multiple viewpoints is a necessity for an organization to flourish. Strategy also alludes to a notion of cause and effect, and the measurement system must seize it. This way the feedback discloses to top management how well the strategy is working (Jones & Moffett, 1999).

Other important system issues include the integration of a composite score, the addition of incentives, and interteam cooperation (Jones & Moffett, 1999). The ProMes and Objectives Matrix methods for team measurement integrate the measures for the team into one composite score. When this is followed over a period of time, the composite index provides a perspective that shows a team how it is doing overall. This allows for "big picture thinking" about the relationship between measures and tells the team if its particular strategy is working. A composite index also makes it easier to calculate a team's bonus because most teams want to be paid for their performance (Jones

and Moffett, 1999). The "big picture" approach is a critical way to begin the measurement development process because when team measures are developed they often focus exclusively on the team and forget that cooperation with other teams is a necessity. Thus, measures that address interteam cooperation and collaboration are needed to ensure that organizational strategy is implemented.

Jones and Moffett (1999) also underscore nine best practices for designing team measurement and feedback systems. First, the measurement system should seize the organization's strategy. Second, the customer's needs should be considered when developing the measurement system. Third, teams should participate in design and share in decision-making to create "buy-in." Fourth, management should review the system to ensure it is on target. Fifth, individual and team goals should be linked. Sixth, the roles of team leader or coach should be used to facilitate feedback meetings. Seventh, feedback should provide motivation and data for problem solving. Eighth, performance feedback should promote team improvement rather than individual review. Ninth, incentives should be considered for team performance because it underscores the significance of linking team measurement system to organizational strategy. While acknowledging that team incentives are risky, Jones and Moffett believe they are necessary to sustain motivation and focus on the team. The incentive system should reward interteam cooperation and should be the last aspect added to the measurement system.

The Impact and Benefits of Team Performance Management Systems

The purpose of a team measurement system is to incite performance improvement regardless of the methods and procedures used for developing the system. Jones and Moffett (1999) clearly articulate that the measurement system is only as good as its use. It is much more than a technology to be used by organizations. It is a powerful and interactive instrument that can only be as useful as its design and use. They suggest it is much better to have an informal, less complex system that is used for continuous improvement and problem solving than to have an intricate, formal system that is not used effectively by the team nor fully understood. With a well-designed, user-friendly measurement system, the potential for continuous team improvement is immense because a supportive organizational culture fosters its implementation.

A number of practitioners and researchers cite the benefits of team performance measurement systems. An effective measurement system provides teams with the same type of business data once used only to manage entire organizations. Jones and Moffett (1999, p. 157) state, "A measurement system lets a team see itself as a business and establishes accountability. With a measurement system, a team has direction and focus for its energies." They also suggest that without feedback from a measurement system, team members cannot comprehend their purpose on the team or improve their specific segment of the organization's performance. Those organizations that successfully implement teams utilize measurement and feedback systems that enable teams to monitor their performance and progress while solving problems.

Mohrman and Mohrman (1994) cite four important uses of team performance review information. First, the information can directly affect performance by providing feedback to the team so that they may determine what adjustments in performance are needed. Second, this information can determine when performance definitions are no longer valid so that changes can be made to the system. Third, it can disclose developmental needs, and it can be used to suggest a process to repair the problems. Finally, the team performance review systems can help determine a reward system for encouraging and maintaining effective performance.

Team performance management systems overcome obstacles to success, and recent research suggests that team involvement also augments team effectiveness. Team measurement systems have been designed to overcome two major hurdles to team effectiveness (Meyer, 1994). The first hurdle is poor team development. With a team measurement system, specific training needs are identified, and the proper people obtain the needed skills. Mohrman and Mohrman (1994) agree that this is a crucial step in effective performance management. The second hurdle identified is language discrepancies. A measurement system should ensure that the team members develop a common language for their expected goals and results. In addition, a study with three companies revealed a positive correlation between teams defining their own performance standards and team effectiveness (Mohrman, et al, 1992). The team's involvement in creating the measurement system appears to be an important link to team effectiveness. Ownership leads to high performance (Jones & Moffett, 1999).

Other notable benefits of team reviews have been cited. Team members are more familiar with each other's performance than is the supervisor, and they can therefore evaluate one another more precisely. Peer pressure also proves to be a powerful motivator for team members. The team performance review requests opinions within and outside the team and does not dependent upon the judgment of one person. Team members see each other's work on a routine basis, so their observations tend to be more accurate. Team evaluation also supports the growth of assessment skills among team members who serve as evaluators. Also, team members who recognize that peers will be evaluating their work show increased responsibility and productivity. Team members become more attentive of performance standards and behavioral requirements because they are liable for maintaining them (Harrington-Mackin, 1994).

Despite the numerous benefits of team performance measurement systems, there are certain drawbacks. Team performance measurement systems are time-consuming and complex. It is also at times difficult to detect between contributions of the team and those of individual members. Some team members may feel uncomfortable judging or evaluating other team members. Another drawback is the comprehensive training required in order to become proficient in giving feedback and in functioning as a performance coach (Harrington-Mackin, 1994).

Performance measurement achieves its purpose much better when the job is well defined and when the criteria for successful performance have been clearly outlined. Effective performance measurement stipulates that both the system and the demands of the job itself be clearly defined (Mohrman, 1990). Jack Zigon (1997) agrees that

successful team measurement depends upon a clear identification of team priorities, expected team results, and the proper measurements that address both individual and team performance. To achieve these goals for team performance measurement, the measurement system itself should be designed by employees that are familiar with the organizational contexts in which it will be used. In other words, the team that participates during design and implementation ensures that measurement practices will fit within the context of the team environment. The people who do the work must be allowed to design performance measurement events. These systems will have the greatest connection and ownership when the employees are allowed to determine the critical parameters of measurement. These parameters are resolved by clarifying the purposes, defining what performance is to be, agreeing on the criteria for evaluation, deciding how and when measurement will occur, measuring what the level of performance is, and concurring on what the consequences of the appraisal will be (Mohrman, 1990). Involving teams in the design of measures as well as in the collection and analysis of the performance data will provide them with the vital feedback they need for continuous improvement (Hitchcock & Willard, 1995).

Organizational Culture and Linkage

Teams require a culture that has strong performance measurement attitude, performance ethic, and open communication. It has been well documented that performance measurement is difficult, especially in team-based settings. It is critical that organization culture strongly support effective performance measurement. The system must reinforce the kinds of behavior and culture needed to execute the organization's

goals. If the organization wants effective teams and team members, it must include team performance measures as an integral part of employee reviews. As long as the performance measurement system rewards only job-based or task-based performance, the team will always question the organization's commitment to a team culture (Harrington-Mackin, 1994). Conducting effective performance measurement must be highly regarded in the organization. Just as crucial is having an organizational culture with a strong performance ethic (Katzenbach & Smith, 1993a). Teams cannot exceed unless the organization is oriented toward performance and makes outstanding performance its top priority. Katzenbach and Smith cite this as the most critical organizational factor that determines the success of teams. Positive role models for performance ethic and performance measurement are needed. Top management must display its seriousness toward this performance ethic and in the development of a proper performance measurement system.

In addition, effective performance measurement depends upon open, effectual communication between employees and managers. A lack of clear communication and good relationships makes the appraisal process virtually impossible. Positive cultural conditions in an organization are both a precondition and the core of effective performance measurement systems (Lawler, 1996; Mohrman, 1990).

An organization must simultaneously manage the performance of the organization, business unit, team, and individuals. At each level, the measurement practices must be aligned, nested within, and harmonious with those of the broader unit (Mohrman, et. al, 1992). To be useful, any performance measurement system should link

without deviation to the organization's mission and strategy (Hitchcock & Willard, 1995; Jones & Moffett, 1999). The key to effective team performance measurement systems is the link and clarity with which the system fits the organizational context and vision set by top management. Initially, top management must set a business strategy. It is critical that any performance measurement is aligned and consistent with the vision and strategies at the top of an organization. For this to occur, top management must be involved in delineating organizational goals and setting business strategies that will be readily translated into measurement practices (Mohrman, 1990). Meyer (1994) believes, "Top managers must set strategic goals, show a team how it fits into those goals, and train the team to choose its own measures." He believes most top managers in American companies use the team's measurement system to regulate and control the team. Rather than monitoring the team, management best serves the team by setting strategic goals and a vision from which the team can design its own measurement. Indeed, understanding the values of the organization is a critical first step in the development of team performance measurement. There must be a full understanding of the goals and strategic plan. Questions such as "What are the organization's goals?" and "How does the organization intend to achieve those goals?" must be answered. Understanding the vision, values, goals, and strategic plan of the organization represent prerequisites for effective team performance measurement systems (Jones, 1996).

Levels of Measurement

In most organizations team members have been solely measured at the individual level. This focus on individual taskwork encourages individualistic ideals rather than

teamwork. Many authors and researchers have suggested that adding team performance measures to individual measures represents the cornerstone of effective team-based performance measurement (Mohrman, 1990; Mohrman et, al., 1992; Harrington-Mackin, 1994; Hitchcock & Willard, 1995; Mohrman & Mohrman, 1994; Meyer, 1994; Shaw & Schneier, 1995; Levy & Steelman, 1996; Zigon, 1997). According to Mohrman's (1990) investigations, measuring team performance results in more effective performance of both the team and the individuals. A complete reliance on individual measurements has resulted in only slightly improved individual performance with little, none, or counterproductive effects on team performance. Mohrman suggests that it is more productive in team settings to start with organizational and team performance and measure individual performance within that context rather than beginning with individual performance and making the assumption that good individual performance instinctively means good team or organizational performance. Mohrman and Mohrman (1994) take measurement a step further. They believe performance must be managed deliberately at three levels of performer--individual, team, and business unit. A team's reliance on traditional individual measures can cause members to forget team goals and regress to old functional ways of operating or even disagreements (Meyer, 1994). Despite the numerous advantages cited, measuring performance at multiple levels within the organization is considerably more complex than more simple, individually based measurement systems (Mohrman & Mohrman, 1994). Because of this complexity, organizations and top management must invest the time, energy, and resources needed to correctly implement a team-based measurement system.

Measurement Needs

Team behavior can be categorized in two ways, taskwork and teamwork. Taskwork is any behavior performed by individual team members that contributes to team outcomes. It involves specific individual behaviors that are required for performance, such as an individual's specific obligations mandated to complete the group task (Levy & Steelman, 1996). Teamwork is different because it includes the necessary team dynamics and interactions required for coordination among members to achieve the goals (Morgan, Glickman, Woodward, Blaiwes, & Salas, 1996). Levy and Steelman add that teamwork revolves around three aspects: communication and coordination, feedback, and team cohesion and roles. A well-designed team performance measurement system will capture both taskwork and teamwork.

Critical to well-done team performance measurement is a balance between measures of output or results and input or process measures (Levy & Steelman, 1996; Harrington-Mackin, 1994; Meyer, 1994). Organizations often err by focusing only on outcomes while neglecting team processes necessary to achieve outcomes or results. Result or output measures tell an organization how its doing in its effort to achieve goals. These measures of performance include the achievement of team goals, customer satisfaction, quantity and quality of work, and job knowledge or technical/professional skills (Harrington-Mackin, 1994). They also include financial measures, such as revenues, gross margins, costs or goods sold, capital assets, and debt systems (Meyer, 1994). However, output measures do not tell a team how it achieved its results, or more importantly, what it should be doing differently. With process measures you can monitor

the tasks and activities throughout an organization or team that produce a given result (Meyer, 1994).

In team performance measurement systems, the input or process measures are just as important as the output/results measures. Despite the confusion and anxiety that may occur initially, a shift from traditional result measures to include process measures is critical. The emphasis is now on both types of measures. Unlike a traditional hierarchic organization, a team-based setting requires and also makes it feasible to use process measures. Process measures include support of team process, participation, communication, collaboration and collective effort, conflict resolution, participative decision-making, problem-solving and analytical skills, credibility and trust, interdependence, commitment, adaptability, interpersonal relations, initiation of ideas, leadership, acceptance of change and risk taking, and team spirit and morale (Baker & Salas, 1996; Harrington-Mackin, 1994). Organizations that use both result and process measures are able to identify their progress toward objective goals while managing the important, internal processes that allow a team to see how it achieves those goals. Those that get bogged down in the interpersonal aspects of teamwork often get off track while those who focus on the bottom line may not properly develop their teams and thus lose out eventually.

Performance Goals and Goal-Setting

Goals serve two motivational purposes. They arouse people to action, and they channel an individual's time and energy in a particular direction (Sweezy, et al., 1994). When an individual realizes that his or her performance may be evaluated, it is likely he

or she will be increasingly motivated and, thus, perform better (Penner & Craig, 1992, as cited in Sweezy et. al., 1994). The same has been found for groups or teams of individuals. Social loafing or reduced effort happens because an individual's output cannot be evaluated by others or isolated for observation. Teams will loaf because neither a supervisor nor team members can evaluate themselves. An empirical investigation by Harkins and Szymanski (1989) demonstrated this effect with groups. Using both an optimizing task and a maximizing task, the researchers found that by providing a group a standard that allowed the group to evaluate its performance, the loafing effect was eliminated. Just as it does for individuals, when teams evaluate themselves against a criterion or goal, loafing is reduced while motivation and performance increase.

Goal setting has consistently proven it produces higher performance (Mitchell & Silver, 1990). The best teams transform their common purpose into specific performance goals. If a team fails to establish specific performance goals, or if those goals do not relate directly to the team's overriding purpose, team members become confused, pull apart, and regress to substandard performance. However, when purposes and goals build on one another and are combined with team commitment, goals become a potent vehicle for performance (Katzenbach & Smith, 1993b). The first step for a team trying to derive a purpose meaningful for its members is the process of transforming broad objectives into specific performance goals. Specific, team performance goals define a set of work-products that are unique from both organizational mission and individual performance objectives. In addition, specific performance objectives facilitate the process of clear

communication and constructive disharmony within the team. When team goals are clear, discussions can center on how to chase them or whether to change them. Katzenbach and Smith (1993b) also emphasize that unclear, ambiguous, or nonexistent goals lead to unfruitful team discussions and interactions. Performance goals are powerful because they represent symbols of accomplishment that motivate and invigorate. They challenge people on a team to commit themselves, as a team, to make a difference. The feasibility of specific goals helps a team maintain its focus on getting results.

A study of goal specificity with work groups demonstrated its effects on performance. The subjects were female sewing machine operators with a control group. It was shown that specific goals and feedback from management were associated with significant improvements in group cohesion, goal commitment, and improvements in product quality. Improving the clarity of feedback and the specificity of goals provided a clear focus. These results seem to agree with the majority of literature that links increasing specificity of task goals to increased work effort (Koch, 1979).

Specific objectives produce results favorable to team behavior. Successful teams evaluate what and how each team member can best contribute to the team's goals regardless of the person's rank or personality. Specific objectives allow a team to achieve small victories as it pursues its broader purpose. With a sense of urgency and a healthy fear of failure, teams are driven to maintain their focus on a reachable, but ambitious goal. The potent combination of purpose and specific goals is essential to performance. Clear performance objectives help a team keep track of progress and hold

itself responsible while the broader aspirations in a team's purpose supply both pointed and emotional stamina (Katzenbach & Smith, 1993b).

A number of researchers have experimented on the effects of goal setting on performance outcomes. One meta-analysis discovered goal-setting increased performance with an average effect size of .75 standard deviations (Guzzo, et al., 1985, as cited in Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1988). Pritchard et al. (1988) sought to replicate such findings with more complex jobs that are increasingly common in interdependent, team-based environments. They based their study on five organizational units within an Air Force base. After collecting baseline data for eight to nine months, the investigators implemented group feedback for five months followed by goal setting plus feedback for another five months. They found quite powerful effects. Group-level feedback and goal setting increased productivity 75 percent over baseline. A matched control group showed little or no increase in productivity. Goal-setting alone accounted for a 25 percent increase in productivity over the effects of group-level feedback. In addition, work attitudes such as job satisfaction, turnover intentions, and morale were as good or better when compared to baseline data.

Other researchers have also investigated the effects of group goals. Mitchell and Silver (1990) studied four types of goal setting for teams working interdependently on a test. These conditions included (1) no specific goal, (2) an individual goal, (3) individual goal versus group goal, and (4) a group goal. The individual goal produced competitive emotions, strategies, and behaviors while producing significantly lower performance than when a group goal was set or subjects had no specific goal. The team that set individual

goals performed the worst. In fact, this team performed lower than the team with no goal at all. The team with both individual and team goals performed the best, although the difference in its performance was not statistically significant compared to the no-goal and team-goal conditions. Because of the ambiguity of individual goals within team performance, Crown and Rosse (1995) investigated 60 pre-existing interdependent groups of professional sport and intramural teams. They experimented with egocentric individual goals, group-centric individual goals, and group goals alone and in combination with group-centric individual goals. They discovered that group-centric individual goals and group goals given in combination increased group performance on interdependent tasks 36 percent more than that of the control group and considerably more than any other goal condition. Thus, these researchers demonstrated that individual goals grounded in team performance objectives build on the efficacy of team goals alone.

Not only are clear and challenging goals vital to team performance, but teams must be active participants in performance and goal definition. Mohrman and Mohrman (1994) believe the manner in which performance is managed is at the core of empowerment, since it corresponds with direction and ability. Teams should be active stakeholders in the process of goal setting while working with managers and other teams. To produce maximum effectiveness, internal team planning and the setting of individual goals should also be largely team defined. Research results from Mohrman and Mohrman demonstrate that those teams who define performance themselves achieve more than when managers define performance for them.

Performance Measures

Because defining performance represents an impressive force on subsequent performance, the process of selecting performance measures becomes vital. Over documentation is wasteful but inadequate documentation of performance objectives leads to incongruent understandings and obligations and to considerable performance delays (Mohrman & Mohrman, 1994). Steve Jones (1996) suggests measurement systems should not be so bulky that they cannot be changed when needed. He believes a team should limit the number of measures it wants to use. Measurement bureaucracy or an excessively large or inflexible measurement system squashes improvements. This represents one of the greater challenges in performance measurement. Jones (1996) suggests that the measurement system include only the major points needed to reach its performance goals. Meyer (1994) forewarns that having too many measures detracts team members from their goals and focuses them needlessly on collecting data and monitoring their activity. He has witnessed teams that spend most of their time at meetings pondering and discussing the mechanics of their measurement system rather than focusing on what they need to do. Meyer suggests that a team's measurement system should not include more than 15 measures. If so, they need to take a second look at the importance of each one.

Jones and Moffett (1999) suggest it is not just a best practice but also a common practice to adopt a family of measures. They indicate that the best answer to the number of measures a team should have is "a vital few." From four to eight are appropriate if a team receives monthly feedback. These authors point out that most organizations have

more data than teams can gainfully use. It is imperative than the number of measures is reduced from the possible total to prevent the team from being smothered by measurement bureaucracy. Enough measures should be in place so the organizational strategy is secured. This might require a few more measures than the number simply necessary to obtain output performance. The ideal number of performance measures also depends on the frequency of feedback. While a team that receives monthly feedback only needs approximately five measures, a team that receives quarterly or semi-annual feedback might need more than fifteen. Production teams usually require fewer measures than knowledge teams. As the complexity of the knowledge work increases, the number of measures needed to manage the team's performance also increases. Therefore, teams in R&D might require more measures due to the complexity of the work they perform.

Performance Raters

Many researchers promote multiple raters as the best means for assessing performance, especially with teams (Mohrman & Mohrman, 1994; Carrell, Elbert, & Hatfield, 1995; Shaw & Schneier, 1995; Levy & Steelman, 1996). Who knows better the performance of teams and their members than those who work within their environment? The flattening and subsequent elimination of management levels in many organizations have forced the role of appraisal down to a level where performance can be precisely reflected. Those managers who remain in an organization have far less control over the way individuals perform their jobs and are therefore unable to carefully observe performance issues or concerns. In fact, the transformation to multiple raters, or the "360 Degree Feedback" approach to performance measurement, was energized by the team

movement so that organizations could create an effective way to provide feedback to each team and its members (May, 1996). Mohrman and Mohrman (1994) believe those who have a stake in the performance should manage performance. Managers are often in a relatively poor position to appraise a team's or team member's performance. Employees usually spend the majority of their time with their team, peers, and customers rather than with their managers. In high performance organizations, teams work together and with other co-workers for customers. Therefore, peers and customers should be a primary source of performance measurement data (Hitchcock & Willard, 1995).

There are a number of stakeholders in a team's performance. These stakeholders include the team itself and its members, the team's customers, other teams in the organization or business unit that work closely with the performing team, and the managers that are responsible for the team and the business unit. Levy and Steelman (1996) present a prototypical performance measurement system for teams that focuses on multiple raters evaluating team performance. Depending on the type of team, they expect performance to be measured by the team itself, peers, supervisors, subordinates, and customers. Shaw and Schneier (1995) agree that the sources of performance data in a multiple rater performance measurement system include co-workers, team leaders, supervisors or managers, and both internal and external customers. Self-ratings also are added to the system because that reveals inconsistencies between self-ratings and other ratings.

A variety of benefits and a word of warning should be highlighted for organizations utilizing measurement systems with multiple raters. Edwards (1992, as

cited in Carrell et al., 1995) discusses five such advantages. First, it reduces the subjective, judgmental role of the supervisor so that he or she can improve his or her coaching role. Second, rater errors such as leniency, central tendency, and recency effects can be divulged. Third, multiple raters ensure procedural fairness in the measurement process. Fourth, it standardizes the assessment method for all being appraised. Finally, it increases employee involvement in managing individual performance. Other benefits of using multiple raters include the sense of true empowerment and participation gained by team members and the opportunity for open and clear communication between team members during peer evaluation (Levy & Steelman, 1996).

As a warning, Mohrman and Mohrman (1994) caution against giving too much consideration to customers in this measurement process. For the most part, customers are much more interested in results rather than the processes that lead to the result. Therefore, too much focus on meeting customer needs impedes the team's development or internal processes. The key to team-based performance management is then a balance among these various stakeholders with which the team interacts.

Team Characteristics

In addition to the complexities of developing and maintaining an effective team measurement system, it is necessary to consider specific characteristics such as team size that impact performance and evaluation. The motivating effect of performance appraisal is moderated by team size. As a team's size grows, a given individual may feel that the probability that his or her specific performance will be observed and assessed is

decreased (Sweezy, et al., 1994). Thus, the potential for social loafing increases as the number of individuals on the team increases. Morgan and Lassiter (1992) report that increasing the size of a team becomes a double-edged sword. They believe that increases in team size beyond a certain point may result in diminishing returns and can even impede team performance. One group of researchers investigating knowledge work teams found that teams perceived as too large for their tasks were less effective than those whose size was perceived as being appropriate or too small for their tasks. This finding was contradictory to the results reported in a similar study with manufacturing teams (Campion, Papper, & Medsker, 1996). Katzenbach and Smith (1993b) note that virtually every effective team has between two and 25 persons. The majority of them had 10 or fewer members. They indicate that small team size is more of a pragmatic guide than an absolute requirement. Large numbers of individuals have difficulty interacting effectively as a group in addition to actually doing real work together. Common sense would suggest that a group of 10 or fewer persons is far more likely to work through individualistic and hierarchical differences toward a shared plan while holding themselves mutually responsible for the outcomes.

Issues of team heterogeneity and homogeneity should also be considered when examining performance. These include such demographics as gender, age, and permanence. Gender-mixed groups tend to be more harmonious and spend more time and effort on interpersonal issues than on task-related behaviors. Non-mixed gender teams, on the other hand, tend to be more task-oriented, individualistic, and antagonistic (Shaw, 1976, as cited in Sweezy et al., 1994). Younger teams usually outperform older

teams on jobs requiring sensory perceptual acuity, speed, or fine motor responding or on complex cognitive processing activities. Also, teams that are homogeneous in age are much more likely to relate mutually to one another and perform more effectively (Morgan & Lassiter, 1992). Additionally, teams with members that belonged to one team, that consisted of mostly permanent members, and that functioned especially as a team possessed more positive team characteristics and were often viewed as more effective (Campion et al., 1996).

Team Performance Feedback

The benefit of performance feedback has become one of the most accepted principles in psychology. In a meta-analysis of psychological based interventions, feedback was found to have an average effect size of .35 (Guzzo, et al., 1985, as cited in Pritchard et al., 1988). A number of researchers have studied the feedback process in order to determine its value. As mentioned previously, Koch (1979) experimented with female sewing machine operators by implementing specific goals and feedback from management. The effects from specific goals and feedback were associated with significant improvements to group cohesion and goal commitment, in addition to improvements in product quality. The increased clarity of feedback along with the specificity of goals provided these women with a clear focus so that quality improvements happened simultaneously with the precise time at which feedback of progress toward goals was initiated.

Because the majority of feedback research has concentrated on individuals, more recent investigations have analyzed its effects on groups or teams of workers. Barr and

Conlon (1994) investigated three types of group feedback on persistence intentions of new behavior. They randomly assigned 180 students to 60 three-person groups. Analyses revealed a main effect of group level feedback. Positive group feedback tied to an incentive resulted in greater persistence intentions. A previously mentioned investigation revealed the effects of feedback on the types of jobs that are becoming increasingly common in today's organizations (Pritchard, et al., 1988). Those jobs involve complex work that relies on interdependence with others as part of a team. Using five organizational units at an Air Force base, the researchers collected baseline data on productivity for eight to nine months. After the implementation of five months of computer generated group feedback, productivity increased 50 percent over baseline while a control group showed little or no improvement. Analyses of attitude, morale, and turnover plans were also improved in the experimental groups that received feedback.

Feedback involves observing and monitoring the performance of team members including the giving, receiving, and seeking of job-relevant performance feedback. Peer evaluations of performance are especially important here. The teamwork perspective involves the persistent process of performance monitoring and feedback to guarantee that backup, cooperative behaviors are performed when needed (Levy & Steelman, 1996). Teams need regular or continuous feedback that is not possible in traditional measurement systems. Traditional appraisals conducted by supervisors or managers usually occur only once or twice a year. Because of this, the information provided to an employee may be shocking and, thus, not assimilated. These types of appraisals often do not impact subsequent performance. Performance feedback is critical because it links

itself to all other aspects of performance management. It is intended to provide the employee information so that he or she can make the necessary adjustments in performance. It may also identify performance definitions that are no longer satisfactory and suggest new ones. Performance feedback can reveal any inadequacies in a person's performance that should be corrected through developmental training. In addition, the feedback process can be utilized as a means to determine a fair reward for the employee so that preferred performance will persist (Mohrman & Mohrman, 1994).

The most advantageous performance measurement systems allow for constant feedback to the employees at both an individual and team level so that behavior change can take place immediately before poor habits develop and problems intensify. Peer or team member feedback helps because it allows the team to become more adaptive and productive (Mohrman, 1990). Equally important is the level of support that feedback is provided by the culture of the organization. Team-based organizations demand a culture or environment that is open and supportive of feedback. Team members will fail to accept a complex appraisal and feedback process unless the culture is supportive (Levy & Steelman, 1996). In the most effective organizations, feedback is ongoing and continuous so that the formal appraisals are relative systematic reviews of what has been happening. The employee is rarely surprised by formal appraisals where feedback is an ongoing part of the culture. These reviews should be done frequently so performance stays on track, performance goals and definitions remain appropriate, and training needs are met. Teams who track their own performance will eliminate the shock from formal appraisals. It is important that all stakeholders and issues are covered; time spent on

defining performance will minimize the time needed to review. Thus, the annual performance appraisals should be conceptualized as a summary of reviews done more frequently. In addition, the connection of feedback and organizational planning reinforce the attachment between the measurement system itself and the business strategy. Team feedback verifies how well this strategy is working rather than how well individual team members are performing. Team feedback of this nature transfers the focus from individual appraisal to a universal-improvement process and eliminates many of the damaging effects of feedback (Jones & Moffett, 1999).

Hitchcock and Willard (1995) discuss in depth the principles of feedback in their "Team Improvement Review." First, they suggest that a team merge planning and feedback into single meetings. The entire work team should meet to regularly reflect on the past and plan for the future. Second, the meeting should be arranged around open-ended, thought-provoking questions that motivate team members to think critically and accept ownership of their team's work. Third, the timing of the appraisal should be aligned with the natural flow of the work. Meetings should be scheduled around certain milestones in performance. Fourth, individual ratings ought to be eliminated from the feedback process. Ratings or grades provide no useful feedback. What is helpful is feedback about the specific performance that led to the grade. Fifth, both individual and team feedback must be provided from multiple sources. Team members can evaluate their own performance before receiving the feedback from others. Sixth, the feedback should include data about customers and competitors. The review should compare the team's performance to the needs of the organization, not just those of its manager. Using

feedback from customers and information about their competitors is especially relevant. Customers may even be allowed to participate in the feedback process directly or indirectly through the use of surveys or focus groups. Finally, a natural way to document results should be developed. Whenever possible, Hitchcock and Willard suggest letting the team document its own performance. Team performance is dependent on feedback, but most organizations have confused evaluation with feedback. When a team is given the obligation to track and regulate its own performance, the focus naturally shifts from evaluation and rebuke to data analysis and problem solving.

Teams that are regularly provided with informal feedback about performance will be open to both the midyear update review and the annual performance review. A more formal midyear update includes a discussion of the employee's and teams progress toward their goals. Discussion also focuses on individual demonstrations of competencies while citing changes that need to be made in the performance goals. By the time of the annual performance review, very few surprises occur. At this time suppliers and customers should also be contacted to help with feedback. Conflicts between peer reviews, individual reviews, manager reviews, and customer reviews will provide an eye-opening experience for all involved. The performance feedback and review process is the summit of a yearlong process designed to fortify continuous improvement while building teamwork and motivating productive behavior. The feedback's critical purpose is to promote face-to-face discussions focusing on the assessment of past results and on training the employee or team member for the future. The review and feedback system should focus on individual and team performance over time, rather than making a quick,

snapshot contrast with the other members of the team. Finally, the feedback and review process should help to determine fair compensation practices for those being reviewed (Salas, 1995).

Jones and Moffett (1999) have also underscored the importance of team performance feedback as a means to impact team member motivation and problem solving. Performance feedback often uncovers a gap between team goals and team performance. This gap may stimulate the team to push itself, therefore increasing the occurrence of successful team performance. This gap between expectations and performance can interact with the competitive nature of a team to increase performance. However, some teams can become frustrated and disillusioned if they receive negative feedback. If the organizational culture punishes inadequate performance, teams eventually learn that negative performance feedback leads to "gloom and doom." If management concentrates exclusively on negative feedback, team members will develop an apathetic attitude and will cease performing. In addition, constant negative feedback destroys team cohesion and damages motivation in team members. This usually leads to blame and to the surfacing of unresolved issues such as contradictory goals.

Team performance feedback also serves as basic information for a team to distinguish what problems it should absolve and whether its problem-solving strategy is effective. The use of feedback to solve problems can hinder or obstruct if the team interprets this data as an indication of failure. This type of attitude can bring about team dynamics that hamper performance. These attitudes or dynamics sometimes result in scapegoating, blaming the measurement system, or even giving up. To prevent such

negative outcomes, a team must possess a culture that looks to performance feedback as a constructive tool for continuous improvement.

Jones and Moffett (1999) also refer to three factors that enable teams to react positively to performance feedback. These include the alignment of individual and team goals, framing team performance feedback as data for problem solving and as a reservoir for motivation, and encouraging improvement rather than appraisal. When the goals of individuals link with team goals a synergistic force empowers team members to attain higher levels of performance. This is most likely to happen when a team puts forth the energy for honest collaboration to institute its purpose and goals and develop its measurement system. Incompatibilities between individual and team goals often cause members to feel perplexed. Team members need to review the elementary principles of performance management and improvement along with their goals and purpose (Katzenbach & Smith, 1993b). Jones and Moffett suggest first identifying and clarifying the team goal and then aligning each of the individual goals with it. Performance feedback must be viewed as a source of motivation for teams, and this can be accomplished through the development of positive norms and through the attitudes of management, team leaders, and team members. Top management and team leaders should model the proper behavior that reinforces these positive norms throughout team meetings and subsequent performance reviews. Teams can also effectively frame feedback if it is confident that it can make improvements. This is accomplished by having teams successfully meet small goals. It is critical that teams achieve some early

success and develop necessary confidence before moving forward with more difficult problems or objectives.

Rewards

The performance measurement and feedback processes feed into all other aspects of performance management, including fair rewards for the individuals and team. However, this represents special problems for team-based settings (Mohrman & Mohrman, 1994; Saunier & Hawk, 1994). Many times teams are trapped within a reward system that was designed for traditional, hierarchic organizations. A large number of companies have not recognized the importance of changing rewards to align with new, team-based work settings. These companies continue, for the most part, to utilize traditional merit pay systems aimed at individuals as the core of compensation and reward practices. It is difficult to change corporate level practices, and companies do not fully understand the kind of reward practices that are critical for team-based settings. When a shift to teams is made, the reward system should also change in order to support this new organizational design. Despite the difficulty of transitioning to team-based rewards, it is necessary for success. The shift away from individually oriented reward systems should accompany the shift to a team environment. An organization's first impulse when it recognizes a need to alter its performance management system to support teams is an attempt to simply modify the existing individually based system. This is not nearly enough. Individual production should be secondary to team production and team effectiveness. An organization that carries out a reward program that supports the

organizational design and objectives sends a potent message about what is important to the organization and what it will need to achieve success (Saunier & Hawk, 1994).

Mohrman and Mohrman (1994) have studied these issues extensively and found the reward practices varied considerably across organizations, business units, and teams. Their research has revealed that the more people were rewarded for their individual performance, the worse the team performed. On the other hand, the more employees were rewarded for team performance, the better the team performed, the better the business unit performed and more process improvements occurred within their business unit. Research by Mohrman and Mohrman suggests that rewards for individual performance are harmful to team performance, while rewards for team performance not only lead to better team performance but also to better business unit performance. They discovered that a great deal of the impact of team rewards was not due to the rewards themselves, but rather due to the means and processes by which team performance was defined and measured. The adoption of adequate practices for rewarding teams requires good practices for defining, measuring, reviewing, and evaluating performance. This positive jolt of team rewards in and of itself only achieves a small additional bounce in influencing performance beyond the impact of well-done definition and review processes. The main impact comes from defining and reviewing. This declaration is supported by the landmark study conducted by Pritchard et al (1988). Five organizational units at an Air Force base received five months of feedback, then five months of feedback and goal setting followed by five more months of feedback, goal-setting, and non-financial rewards. The feedback and goal-setting increased productivity 75 percent over baseline

measures. The addition of time-off incentives only bumped productivity to 76 percent over baseline.

These findings, on the other hand, do not mean that rewards are irrelevant. Basing rewards on team performance helps to achieve the necessary alignment in the performance management of teams. While rewards for individual performance have a disturbing effect on team performance, rewards do highly affect an employee's sense of pay equity and his or her satisfaction with work in general. Mohrman and Mohrman (1994) discovered that the more people were paid for individual performance the more they felt fairly paid and satisfied, despite the fact that the performance of their teams was adversely affected. This appears to pose a dilemma for managing team performance. The employee's sense of fairness is related to the logic set forth by traditional merit pay systems, but is contrary to the logic inherent in team-based organizations. However, research also revealed that team rewards were also related to a sense of fair pay and general satisfaction. It appears that as people work in team-based environments they begin to adopt the logic of this new design. These attitudes take time and come from actual experience within the new system. The progression to teams will undoubtedly allow people to gradually see traditional, individual merit pay systems as conflictual and divisive. Mohrman and Mohrman believe there will be an increasing demand for new pay systems that take into account the contribution of the individual without pitting team members against one another. They also feel there will be an increased demand for teams to be rewarded for what they have achieved as teams. They suggest two ways in which new reward systems can occur. One can try to change the overall organizational reward

and compensation practices. This approach is appropriate, but it tends to be slower to develop and implement. A more immediate and practical intervention would involve supplementing and making quick fixes to already existing practices that will minimally disturb the team so the people can begin to shift from an attitude of individual logic to team logic. This approach could be utilized as the organization designs and develops a more appropriate compensation system for the team-based environment.

More and more organizations are beginning to redesign reward systems that provide the greatest amount of motivation while reflecting the essence of team values. Gainsharing and other group bonus systems are becoming more common, as are informal rewards that single out teams, rather than individuals. Teams, just like individuals, respond to both external and internal rewards and financial and non-financial rewards. In addition to pay and bonuses, examples of external rewards include plaques, notes, publicity in newspapers, commendations at company parties, certificates, gifts, trips, and dinners. Internal rewards include the satisfaction from attaining the team goal, the sense of contentment deriving from strong work relationships, learning events, increased responsibility, and creative challenges or tasks. Team reward systems must be congruent with the culture in the organization and with the style of management. That is, if the evaluation system emphasizes one set of priorities and the reward system another, the reward system will inevitably prevail. People work hardest on tasks for which they receive the greatest rewards so the focus of reward and recognition systems must be on team rather than individual accomplishments. The organization should also provide rewards at the end of team projects, rather than on an annual basis. If the team is not

highly autonomous, rewards at the team level may be counterproductive whereas pay-for-performance and job-based compensation systems are inappropriate for self-directed or self-managed work teams because they reward individual achievements more than team results (Harrington-Mackin, 1994).

Other authors believe that few management practices are based as much on deceptive data as compensation and reward systems. Kohn (1993) reviewed the research on rewards and reported that rewards punish. He found that not getting an expected reward produces the same impact as punishment. Rewards can fracture relationships between superiors and subordinates and between peers vying for the same reward. Rewards often ignore the behavior at the root of either excellent or poor performance. Rewards discourage risk-taking; people will shift their focus from the task to getting the reward and from quality to quantity. Kohn also suggests that rewards impede intrinsic motivation. The task can become devalued while the performer seeks further rewards. Kohn (1993, p. 67) states, "Do rewards motivate people? Absolutely. They motivate people to get rewards." Hitchcock and Willard (1995) agree and suggest that most reward systems within organizations are based on behavioral principles from work with animals. So management theorists have deduced that if you want your employees to repeat certain behaviors, you should offer them rewards. These often-used reward practices ignore the complexity of humans who interact interdependently with one another in intricate organizations.

Hitchcock and Willard (1995) suggest some alternatives and guidelines for team-based compensation systems. They advise organizations to "share the harvest." A team

comes together to plan, implement, perform, and then share the rewards equally. To do this, all positions should be paid according to fair market value, and the wealth should be shared equitably. It becomes difficult to instill the sense of partnership and cooperation when the reward system delineates employees from one another. They suggest simple gainsharing systems to achieve such goals. Hitchcock and Willard say this approach need not ignore superb performers. For those who truly do stand out a system for rewarding individuals is warranted if it never outshines the group rewards. Individual rewards should be left up to the discretion of the employees as much as possible and be used later as a surprise. This way, individual rewards will not serve as any type of bribe for future performance. Finally, the authors suggest that rewards should never turn into a competition between teams or become limited to a fixed number of teams. The guidelines should be clear to everyone, and everyone who meets the guidelines should win the reward.

Of considerable interest to organizations and researchers is the value of financial versus non-financial rewards for teams. One survey of 150 executives discovered that praise not pay is the key to employee satisfaction. Forty-seven percent of the executives surveyed indicated that praise and recognition are the most important factors in keeping employees satisfied. Promotions were a distant second at 26 percent, while only seven percent cited financial compensation (Poe & Gourter, 1994). Based on a survey mailed to 1,285 human resource practitioners, Shaw and Schneier (1995) discovered differences in team effectiveness based on types of rewards received. They found that effective teams are highly valued and rewarded principally through non-financial rewards. Only

24 percent of their responding companies provided financial rewards, with a little more than one-third of these participants reporting highly successful team experiences. Only 13 percent of marginally successful teams reported the use of monetary rewards. Of those who did utilize financial rewards, 59 percent provided the same reward to all team members. Eighty-seven percent of participating companies used public recognition as a reward, and those that did reported more frequent successful experiences than other companies in the survey. All the chosen companies in phase two of Shaw's and Schneier's study used a well-communicated team recognition system to reward successful teams. Another study based on a survey of more than 2,000 employees revealed that job recognition was a more important factor in maintaining employee loyalty than increased pay, promotions, or challenging work (Moskal, 1993). Studies such as these cite the motivational value of recognition and other non-financial rewards that are often underutilized by organizations.

Team Effectiveness

As the popularity of teams continues to rise, there is an increased need for determining team effectiveness. Organizations who use teams have invested a great deal of time, energy, and resources in their attempt to redesign. With the risk of shifting from a traditional structure to a flatter structure, organizations are extremely interested in how well teams work and the degree of effectiveness they exhibit. Because of these concerns, many authors and researchers have studied this area extensively seeking to discover its important components. The synthesis of research and expert literature on team effectiveness suggests that overall team success is a dynamic, interdependent, and

circular process consisting of team performance itself, well-developed team performance measurement, continuous team performance feedback, and both individual and team rewards. This process is influenced by team characteristics such as team member satisfaction, team size, and team maturity as well as top management's vision and organizational strategy, and important organizational characteristics such as support and strong performance ethic.

There is an intricate connection between effectiveness and a variety of performance management parameters and constructs. Katzenbach and Smith (1993b) suggest that performance measurement is a critical element for all successful teams. However, effectiveness is much broader than performance or production. As the complexity and ambiguity of work increases, measures of effectiveness become more important than sheer productivity measures. It can be defined in terms of productivity, quality, employee attitudes or quality of work life, and behaviors such as absenteeism and turnover (Cohen, Ledford, & Spreitzer, 1996). Cohen (1994) also suggested that team performance, team member attitudes, and withdrawal behaviors represent three dimensions of team effectiveness. The definition of effectiveness, especially with self-managed teams, is multidimensional and considers the viewpoint of multiple constituencies. It views team performance within a social context using multiple evaluations by key stakeholders. Brodbeck (1996) suggests that both situational constraints and group autonomy are factors that can mitigate the relationship between team performance and effectiveness. He sees performance as including motivation, knowledge and skills, and both internal and external collective strategies. Brodbeck

defines effectiveness based on the criteria of task completion, personal criteria, social criteria, and innovation execution. Most researchers agree that effectiveness represents a multidimensional construct of various performance dimensions as well as the satisfaction of team members (Sundstrom, DeMeuse, & Futrell, 1990; Cohen, 1994; Campion, et al., 1996). The combination of performance with viability suggests that in addition to multiple performance indicators, member satisfaction, participation, and willingness to work together are equally important. Thus, team effectiveness is viewed as a dynamic process, not an end-state (Sundstrom, et al., 1990).

Knowledge Work

While the origins of work structured around teams began approximately fifty years ago in production settings, the movement to teams involved in technical, professional work occurred more recently. Technical or professional teams are often called knowledge teams because they perform most of their work in their heads processing information rather than with their hands processing materials (Beyerlein, 1994). Production work teams are characterized by routine, predictable, linear, sequential, and repetitive activities that are usually accomplished in a short period of time guided by prearranged goals. Production work is commonly focused on job simplification designs and eliminating variances from a standard. Knowledge work, on the other hand, has been traditionally depicted as unpredictable, multidisciplinary, and the non-routine participation in nonrepetitive activities with a long time frame and developing goals. Beyerlein (1994) describes this process as "building the boat, while going down river, in whitewater." Purser and Pasmore (1992) characterize it as

exploratory with high incertitude that involves creating, inventing, learning, analyzing, interpreting, reflecting, and some amount of luck. Often, the process of doing work in knowledge-based settings may evolve concurrently with product evolution. Discrepancies might often lead to breakthroughs in performance or product development, so it is wise not to overcontrol these occurrences.

The performance measurement problems and concerns mentioned previously in this paper are further complicated when organizations attempt to assess the performance of knowledge work teams. Knowledge work is difficult to define precisely, but is usually associated with professional intellect. The primary activity of knowledge work is the acquisition, creation, packaging, or application of knowledge. Knowledge is the product in knowledge work. This type of work is typified by variety and exception rather than predictability, and it is most often performed by professional or technical workers possessing a high level of skill and expertise. Such work includes scientific research and product development, advertising, education, and professional services such as engineering, law, accounting, management, and consulting. Knowledge work is often ambiguous and disheveled unlike operational or administrative processes where discernible inputs are acted upon in some structured, predictable way and then transformed into outputs. Knowledge work inputs and outputs involve ideas, obstructions, and inspirations that are most often less tangible and distinct. Most often there are no predetermined task sequences that, if executed, guarantee the preferred outcome. These workers usually operate through intuition about how to achieve their goals or through the accumulations of past experiences (Davenport, Jarvenpaa, & Beers,

1996). The intangible nature of this work is often implanted in the heads of specialists, making process improvements in research and design a unique challenge. It is often referred to as non-linear work that is idea-driven, utilizes a high degree of specialization and individualistic thinking, is broad in scope, and has a long time horizon (Spain, 1996).

The purpose of knowledge work is to eliminate uncertainty, make the situation more predictable and consistent, improve comprehension of project outcomes, achieve utilization of the product's development, and to problem solve (Beyerlein, 1994). Whereas uncertainty leads to error in production work, it provides opportunity in knowledge work. The aim is to create a new product or process, so the road traveled is never one taken previously. Some aspects of knowledge work are always new. This nonroutine quality results in a lack of structure, lack of predictability, surprise, and innovation. "You cannot step into the same downstream process twice, because the new knowledge gained the first time changes the knowledge work environment for all subsequent times" (Beyerlein, 1994). When the nature of work becomes increasingly complex and nonroutine, it is imperative that employee involvement is high. A shift in management style from command and control toward employee involvement maximizes performance results. Management must transform its orientation toward knowledge work in order to capitalize on the intricacies, uniqueness, and potential power of its teams participating in such complex work.

The motivation for professionals in knowledge work settings is typically intrinsic, and extrinsic factors offer little value. Often, extrinsic motivators may obstruct performance during the creative stages of product or service development, although they

may promote performance at the implementation stage when they are connected to performance. Thus, the reward system should fit the nature of the team and the stage of the project. Instead of using extrinsic rewards to arouse knowledge workers, top management should remove obstacles experienced when knowledge workers are trying to do creative work (Beyerlein, 1994). Purser and Pasmore (1992) identified the most frequent external obstacles as evaluation pressure, feelings of constant performance appraisal, rewards tied closely to specific tasks, internal competition, and control over methods for carrying out tasks. Top management must remember a few important concepts. They should not micro-manage professionals (remember that they will get what they reward), but allow professionals the needed autonomy to make decisions, explore, invent, and experiment. Management must create an environment that supports continuous improvement, dynamic processes, and a process orientation. Traditional command and control management practices and structures support the opposite and consequently inhibit learning and creativity. The bottom line for optimum performance for knowledge work teams occurs when the culture and organizational structure support thinking, creating, and admiring (Beyerlein, 1994).

Knowledge work typically involves four distinct levels that allow for a more accurate depiction of work processes. These levels are identified as Information Processing, Technical and Service Providers, Service Delivery Systems, and Knowledge Creation Systems (Purser & Montouri, 1994; McDermott, 1993). Information Processing teams process large amounts of data, are distant from the end customer, rely strongly on computerization, and typically do not perform cognitively complex work. Some

examples include order processing teams, billing teams, and insurance claim departments. Technical and Service Providers have one-on-one encounters with clients or customers. Their output is expert advice made to fit the unique needs and requirements of the customer. These workers typically include attorneys, financial advisors, customer service representatives, editors, technical service personnel, and consultants. In Service Delivery Systems the customer is directly involved in the transformation process through contact with multiple sources of expertise, and output is derived through contact with multiple service providers. Examples of these systems include hospitals, sales groups, and universities. The final level of knowledge work is Knowledge Creation Systems. This level requires technical and service providers from different fields to cooperate, share, and manipulate ideas for solving problems, creating a new product or service.

Performance Management in Research and Development (R&D)

Because non-linear work such as R&D is idea-driven, planning is difficult, and performance is unusually difficult to measure (Spain, 1996). For professionals doing R&D work, each project may be unique, and the methods may be continually developing. Schainblatt (1982) pointed out the difficulties inherent in measuring these knowledge work processes. He found that current methods for measuring the performance of knowledge workers had considerable defects. Five basic categories of obstacles to measuring the productivity of professional, technical, and supportive knowledge workers have been delineated. First, it is difficult to define the output of such a worker. Second, there is a tendency to measure activities rather than results. Third, it is difficult to match

inputs within a specified time frame. Because inputs exhausted in one time period may not show tangible results until much later. The fourth obstacle is including a quality dimension in the measurement. Finally, assessing overall effectiveness in addition to efficiency and productivity, can be an obstacle (Ruch, 1980). Because knowledge work is thinking and discussion work, it often involves much deliberation, non-linear problem solving, novelty, and creativity that creates problems for the current performance measurement body of knowledge.

Performance measurement has been a highly controversial topic in R&D like it has been in other business and industry areas. While American companies spend billions of dollars annually on R&D, most are not fully aware of what they are getting for their money. An 18-year-old study by Schainblatt (1982) revealed that only 20 percent of managers surveyed measured the productivity of R&D operations. Of those who did measure, only a few measured any kind of return on investment. Adding to the controversy is the idea of many engineers and scientists who think it is impossible to effectively measure R&D productivity. Many believe that the very act of measurement discourages creativity and motivation and that management should just "have faith" that R&D is a good investment, without trying to measure it (Brown & Svenson, 1988). There have also been many failures in R&D performance measurement that fuel the controversy and lead many others to erroneously believe that all performance measurement systems don't work.

Since Brown and Svenson's article was published in 1988, organizations that are involved in R&D have begun to recognize the overwhelming need for performance

measurement due to increasing global competition amidst watching the corporate bottom line. Most organizations today use teams to compete in a new, highly complex, turbulent, and uncertain global market that makes managing the performance of R&D professionals imperative. This environment has become even more prevalent as organizations are required to achieve breakthroughs in a rapidly developing, technological arena and to quickly introduce new high-quality products and services. An article by Schumann, Ransley, and Prestwood (1995) indicates that there has been a growing acceptance of the need to measure R&D performance. However, this need is in disparity with the general lack of processes and practices for doing proper performance measurement. They describe this search for appropriate performance measurement processes in R&D as similar to the search for the Holy Grail. Despite the controversy and difficulty measuring R&D performance, scientists and engineers must now demonstrate their worth to organizations that are watching the bottom line in a competitive global marketplace.

Changing business environments today challenge companies to improve R&D processes for a competitive advantage. Many in R&D management have grown to accept and appreciate the need for control of R&D processes through performance measurement (Francis, 1992; Schumann, et al., 1995). A few investigations have shown that the best performing companies already employ definitive performance measurement techniques to R&D (Cooper & Kleinschmidt, 1995; Griffin, 1997). Furthermore, a study by van Drongelen and Bilderbeck (1999) suggests that R&D managers no longer consider performance measurement to be inappropriate. The results of their survey of 225 R&D managers in The Netherlands suggests that these managers place a high value on team

performance measurement and believe it has a positive impact on performance. Their survey results also indicate that R&D mangers place more "value" and "impact" on team performance measurement than individual performance measurement.

Although performance management literature pertaining to R&D teams specifically is scarce, literature does exist about individual R&D performance management practices. The performance appraisal of the professional working in R&D must account for the responsibilities of several stages of technological innovation: basic research, applied research, or product development. While admitting that this type of work is difficult to assess and standards for performance are difficult to establish, performance evaluation should include both process and task-related activity attributes (Roman, 1968, as cited in Meinhart & Pederson, 1989). The factors chosen for professionals in these work settings should be unique (Evans, 1968, as cited in Meinhart & Pederson, 1989). Examples of these factors might include ingenuity, creativity, and ability to plan and conduct research and to prepare reports. A survey of 114 supervisory and nonsupervisory R&D professionals indicated that a goal or management by objectives (MBO) approach was the overwhelming favorite (Meinhart & Pederson, 1989). This MBO approach based on goals and cost-related outcomes should be employed in addition to unique attributes such as creativity and ability to plan research projects that are unique to the research professional. This approach is relevant because the R&D environment involves complexity, dynamics, and high project and individual differentiation.

Brown and Svenson (1988) describe six characteristics of an effective and workable system for measuring R&D performance. First, focus should be on external measurement instead of internal measurement. Internal measurement and feedback is important as an in-process quality control instrument. However, for appraisal purposes, external measures should be emphasized because of their increased importance and validity. Second, focus should include measuring outcomes and outputs, not behavior. An effective R&D performance measurement system should emphasize outputs and outcomes, not the activities of scientists and engineers. Outputs and outcomes should be measured along three dimensions: quality, quantity, and cost. Third, measure only valuable accomplishments or outputs. Only those outputs or accomplishments for which a value can be established should be used as measures. Fourth, make the measurement system simple. Measurement indices should be developed that represent many aspects of performance. The best measurement systems are based on the collection of data on six to eight key indices and should be a combination of quality, quantity, and cost measures. Fifth, make the measurement system objective. While quantity is typically objective, quality and cost data are often very subjective. Use outside data whenever possible in assessing the quality of a researcher's work. Sixth, separate research and development evaluation. The primary output of research is information or knowledge relevant to the company's business. This information is input for development, whose outputs are products and processes. Because of these major differences, any measurement and appraisal system should be designed to track different indices for research and development.

Team Development or Maturity

The concept of team development is not a new one. Discussions of developmental processes have been discussed in literature for approximately fifty years. The first comprehensive, integrative publication occurred in 1965 by Bruce Tuckman. Tuckman analyzed 50 articles dealing with stages of group development over time separated by group settings. These settings included therapy-group studies, T-group studies, and natural and laboratory-group studies. Based on these studies, Tuckman proposed four general stages of development that fit stages he observed in the social realm and task realm of group development. This allowed him to isolate those concepts common across the various studies he reviewed. His model was to serve a conceptual function as well as an integrative and organizational one.

The first group developmental process has been called Forming. Groups or teams initially concern themselves with orienting behaviors. Such testing behaviors serve to recognize the boundaries of both interpersonal and task conduct. In addition to testing in the interpersonal realm, there is a concurrent establishment of dependency relationships with leaders, other group members, or preexisting criterions. The second stage in the sequence is called Storming. This stage is characterized by conflict and antagonism around interpersonal issues, with accompanying emotional responding in the task realm. These types of behaviors serve as resistance to group influence and task requirements. Resistance is conquered in the third stage called Norming. At this point, cohesion develops, new standards evolve, and new roles are embraced. In the task realm, confidential, personal opinions are expressed. Finally the group attains the fourth stage

called Performing. Here, interpersonal structure becomes the tool of task activities. Roles become flexible and utilitarian, and the group's energy can be focused on the task. Fundamental issues have been resolved, and structure can now become supportive of task performance.

The model, largely inspired by the literature, also seems to possess strong common sense and consistency with developmental theory and research in other areas (Tuckman, 1965). Observers would expect "newness" of the group to be acknowledged by orienting behavior, uncertainty, and the reliance upon authority figures to deal with insecurity. After the "newness" has worn off, members respond to both the demands of the group and the task emotionally and with skepticism that presents an obstacle for further development. If emotionality is overcome and is followed by cohesion and sensitivity within the group, the Norming stage is reached. Finally, the group becomes a utilitarian tool for dealing with each impending task. Interpersonal problems are laid to rest, and the group's time and energy can be devoted to task solutions. Although the model appears to fit literature and appeals to common sense, it cannot be viewed as an absolute and definitive sequence for every group. The indefinite number of settings and conditions within which groups reside and work cannot be totally accounted for by one singular model. However, this model has value and merit for the developmental processes of the majority of groups or teams. This topic was revisited 12 years later by Tuckman and Jensen (1977) in their review of published literature on group development validation for Tuckman's proposed stages. The authors analyzed 22 studies to determine if the model had been empirically tested. While only one study empirically tested the

model, the other studies validated the proposed stages and added another. Two studies reviewed by Tuckman and Jensen suggested the importance of a termination stage and the value of adding separation issues in group development. Tuckman and Jensen discovered that the "death of the group" becomes an extremely important issue to many of the group members. Thus, the Tuckman model was amended to include a fifth stage: Adjourning. The model now stands: Forming, Storming, Norming, Performing, and Adjourning.

Tuckman's initial four stages of group development was empirically analyzed in a study of the effects of performance management practices on the perceived effectiveness of knowledge work teams (Roberts, 1998). Eighty-six knowledge work teams reported their current stage of development that was subsequently compared to perceived effectiveness. Stage of development was a significant predictor of perceived effectiveness. Teams in the Norming stage were more effective than teams in the Forming stage. Teams in the Performing stage were more effective than teams in either the Forming stage or the Storming stage. This analysis suggests that team developmental processes are an important factor in the effectiveness of knowledge work teams. Organizations need to support the developmental processes of their teams so that they may progress to more optimal stages of development. Mature teams appeared to outperform less mature teams in this sample. However, these results are tempered by small sample sizes within the first two developmental stages and should be judged with some caution.

Problem and Rationale for the Study

Despite the ever-increasing popularity of work teams, many organizations continue to struggle with how to adequately measure and manage team performance. A shift to team-based structures has the potential to dramatically increase organizational effectiveness while enabling a company to continue to meet the challenges of an increasingly competitive global market. It is assumed that the disappointments some organizations have encountered with teams can be traced to the lack of organizational support systems in place. Primarily, few organizations are adequately assessing or rewarding team performance. It has been emphasized that an important component in all successful teams is performance measurement (Katzenbach & Smith, 1993b). Yet a survey of 100 Fortune 500 companies revealed that 80% of the participants had difficulty evaluating their teams' work (Eisman, 1995). In another survey of 88 organizations with teams, investigators revealed that a majority of companies lack individual and team goal-setting skills, individual and team performance feedback systems, and effective rewards (Tippett & Peters, 1995). Work by Shaw and Schneier (1995) states that measuring and rewarding team performance are considerably difficult for many organizations and few are content with their current assessment methods. Others have discovered that the techniques for managing team performance are under-developed (Mohrman et al., 1992). Many organizations fail to introduce new patterns for rewarding and managing performance when the switch is made to teams. Most assume that the old, traditional, hierarchic methods for evaluating individual performance can be utilized with their teams. The love affair that corporate America is having with teams has blinded many

from making substantial changes in training, design, or support systems. It seems that in this rush to implement and utilize teams, a majority of companies are not prepared to successfully support these teams through well-developed performance measurement and reward systems.

Empirical research about teams and team performance management has not been plentiful or well constructed despite the overwhelming popularity of teams. A few studies have shown that measurement systems result in an improvement in work group and team performance (Jones, Powell, & Roberts, 1990; Jones, Buerkle, Hall, Rupp, & Matt, 1993; Pritchard et al., 1988). However, little is known about how the use of a measurement system eventually results in improvements in team performance. This continues to be an area in which practice leads research. Organizations and teams should not have to rely upon trial and error problem solving to adequately assess team performance. The study of the systematic processes of team performance management is needed to comprehend how these processes are best transformed into improvements in team performance. Whereas in professional athletics teamwork has become a science, in knowledge work settings this is not nearly the case. Research is overwhelmingly needed to move the area of team performance management from art to science.

The work that has been published has focused primarily on teams involved with manufacturing work. Much less is known about knowledge work teams where greater ambiguity exists. Despite the ease at which some performance measures can be collected, organizations vary considerably in their efforts to do so. Very little assessment data is collected about the internal processes of teams or their transactions with other

teams and business units within the organization. Organizations also struggle to provide effective team performance feedback in a consistent manner despite considerable experience with the "teaming" process. The problems with team performance measurement are compounded for those attempting to measure the performance of technical or professional teams involved in research and development. The performance of white-collar, R&D knowledge workers is considerably more difficult to assess because of the non-routine nature of their work and the complexity that is involved.

The majority of team performance management research that has been published has been primarily anecdotal, unscientific, or limited to very small samples. In addition, team performance measurement, feedback, and reward practices for knowledge work teams have not been well represented in literature. The majority of research that has been published on performance measurement in knowledge work deals with individuals rather than teams. However, one recent study has been published investigating team performance measurement and rewards (Shaw & Schneier, 1995). Based on company self-reports of team effectiveness, these researchers attempted to discern the measurement and reward practices of those reporting successful experiences from those who did not. Based on an eight-percent response rate to a mailed survey, the authors selected five companies out of 103 who indicated they possessed highly successful teams. The authors proceeded to conduct in-depth interviews with these five companies in order to identify their measurement and reward practices.

Shaw and Schneier discovered a number of important findings relevant for individuals and organizations interested in team performance measurement and reward

practices. Broad findings revealed that despite the increased use of teams, many remain unsure about how to measure and reward, and their efforts are admittedly futile. Many companies did not believe they had found an effective system for measuring and rewarding their teams. A large number of companies in the sample felt that changes were needed in their measurement and reward systems to support their teams, but most were unsure how to do this or when to do it. Those reporting successful experiences measured and rewarded both individuals and teams. It seemed that the most important rewards people received from working on teams were intrinsic. The sense of achievement, informal and formal recognition, symbolic rewards, and being part of a successful team were highly regarded rewards. The most effective teams were highly valued and rewarded principally through non-financial means. More specifically, only 24 percent of those sampled provided financial rewards to teams. A little more than eight percent of the participants who reported high levels of success offered financial rewards to teams, and only 13 percent of the marginally successful teams used financial rewards. Of those who utilized financial rewards, 59 percent provided the same reward to all team members. This was even more pronounced with those companies reporting high levels of success. Public recognition was the most common form of reward (used by 87 percent of the respondents). Highly successful teams utilized this reward most frequently. Individual incentive programs were used by a little more than 40 percent of companies reporting some level of success. Successful teams consistently rewarded individuals based on their contributions to the team. Such individual rewards included promotions or selection for work on highly valued teams.

The bulk of the findings by Shaw and Schneir pertaining to rewards contradict previous research. They specifically run counter to a statement made by Jones and Moffett (1999) that indicates most teams want to be paid for their performance. These conclusions also challenge research by Saunier and Hawk (1994) and Montemayor (1995). These authors emphasize the use and importance of financial rewards for teams whereas Shaw and Schneir strongly suggest that successful teams should be rewarded in a non-financial manner.

Shaw and Schneier also discovered that companies reporting highly successful experiences with teams measure performance more consistently and thoroughly than other companies. These companies use reviews from team leaders, internal and external customers, and management and self-appraisals significantly more than others do in the sample. Those companies reporting the lowest degree of success used the reviews of immediate supervisors as their most common method and reviews by team members and external customers as their least common method. The survey participants also revealed that establishing clear objectives and expectations was the most significant factor impacting the success of their teams. Other authors and researchers in the literature have supported this particular finding.

A recent unpublished, exploratory study proved to be an important step in the area of team performance management in knowledge work settings (Roberts, 1998). This study examined the performance management practices of 86 knowledge work teams from 27 organizations throughout North America. It was revealed that measuring team performance was critical to successful performance. Those teams who reported that at

least 50 percent of overall performance was assessed at a team level reported greater effectiveness than those teams who were primarily measured at an individual team member level. It also uncovered the importance of feedback in knowledge teams. It was discovered that teams whose members received both individual and team level feedback outperformed those teams that did not receive both forms of feedback. This exploratory study supports the idea that the team must be a major player in the performance management processes of organizations. If knowledge teams are expected to excel, organizations must measure their performance at the team level rather than relying on traditional, individual measurements. Those organizations that emphasized individual measurement over team measurement appeared to obstruct team effectiveness. To be effective, teams must know how they are performing. Without team level measurement processes, teams never know how they are performing and are likely to underachieve. The feedback result suggests that not only do individual members on the team need to know how they are performing but so does the team. In this sample, individual and team feedback seemed to assist the group in adjusting its individual and collective efforts, production, and processes in order to achieve higher levels of effectiveness.

A great deal of the literature on various facets of teams, written mostly by consultants and practitioners, has lacked scientific rigor. The previously cited study by Shaw and Schneier (1995) is no exception, and five weaknesses should be noted. First, the investigators achieved only an eight-percent response rate. A response of 25 percent or greater would have been more credible. An extremely low response rate limits the external validity of their findings. Second, the authors base their conclusions about

effective measurement and reward practices on a small case study of five companies. Five companies reporting a highly successful experience with teams is hardly an adequate sample on which to base firm conclusions. Third, the authors chose these five companies with highly successful teams for more in-depth interviews, which increases the study's subjectivity. Fourth, surveys and interviews were conducted with human resource practitioners. It would have been more appropriate to collect additional data from team leaders or team members. They are the ones doing the work and usually provide a more accurate estimate of measurement and reward practices as well as ratings of effectiveness. Finally, Shaw and Schneier fail to assess or discuss the inadequacies of their study or soften their conclusions despite the weaknesses in their sample, methods, and its case-study design. Despite these weaknesses this work is still important because it addresses one of the most critical problem areas for team-based organizations. Teams cannot be expected to excel unless adequate performance measurement and reward systems are in place. Many consultants and human resource practitioners believe this represents the most important area for improvement in team-based organizations. Without satisfactory assessment and reward practices, it is unlikely that teams will reach the pinnacle of effectiveness that is expected in an ever-increasing competitive economy.

The exploratory study by Roberts (1998) also contained a number of limitations that need attention. One important limitation dealt with subject inclusion. The vast majority of the organizations that participated were new to team performance management and compensation. The lack of participation from organizations and teams with experience in team performance measurement tempers the results. Problems were

also apparent in the survey instrument. In an attempt to prevent inordinate length, the survey was limited by its inability to obtain continuous data on many items. This can lead to inaccuracies or results based upon simplistic data. Missing data was also a problem. Certain survey items were left unanswered by a large number of teams resulting in uneven cell sizes during analysis. Either the instrument was confusing or the lack of knowledge about team performance measurement was evident from the missing data.

Because of a general lack of credible empirical research and the field's overwhelming difficulties with team performance measurement and reward systems, this project was developed to examine performance measurement, feedback, and reward practices in organizations that utilize complex knowledge work teams. Empirically, little is known about these practices and how the most successful teams manage performance. If performance measurement and feedback is indeed a critical variable for all successful teams, distinct performance management processes and practices should be apparent in R&D work as well. The previous exploratory study uncovered the importance of some of these practices in knowledge work teams. Therefore, a thorough investigation of these processes and practices in R&D work teams is not only an important area for research literature but would address a glaring need for team-based organizations. R&D organizations employ and utilize teams in an increasingly competitive, cost-contained, global market. Empirical performance management research is needed so that these teams can reach their full performance potential.

The major purpose of this project is to examine the team performance management practices and processes of R&D work teams. Many organizations report disappointments with teams, and a great deal of the blame can be traced to inadequate or outdated performance management methods. It is expected that this investigation's conclusions will provide some direction for organizations when they design or reconstruct a measurement, feedback, and reward system for their R&D teams. This information is paramount for organizations and will continue to be critical as trends suggest that in the year 2000 about 50 percent of all employees in the United States will be members of work teams. Subsequently, the utilization of knowledge work teams in research and development is also expected to increase dramatically. These types of teams have also proven more difficult to evaluate because of the nature of their work and a past history of resistance to performance management in general. While a comprehensive study investigating performance measurement, feedback, rewards, and perceptions of team performance in complex knowledge work teams is an important contribution for work team literature in general, it also represents a means for addressing one of the most pressing concerns facing organizations today.

Research Hypotheses

The intent of this project is to examine the relationship between performance management practices and four types of team effectiveness for work teams involved in the most complex level of knowledge work. This level usually involves research and development and has been referred to as Knowledge Creation Systems where technical and service providers such as scientists and engineers from different fields cooperate,

share, and manipulate ideas for solving problems, creating a new product or service. Practitioner-related literature exists about team performance measurement in general, but this project will empirically examine measurement processes for teams that have proven most difficult to measure. This difficulty is due to the intangible, ambiguous, and complex nature of the work performed by these types of teams. Performance management has been cited as a significant organizational support system for teams while the measurement system serves as a critical instrument for improved team performance (Jones & Moffett, 1999). For this reason, it is expected that measurement, feedback, and reward practices will significantly impact team effectiveness. Teams need to know how they are performing, but if this is not managed adequately or aligned properly with the nature of their work, performance will likely deteriorate. Continuous improvement is the key to maintaining an effective work environment, and this can only occur through effective performance management. Organizations attempting to redesign or improve measurement, feedback, and reward systems will have empirical knowledge based on this study. These results will enable organizations to make credible measurement decisions rather than decisions based upon the opinions and speculations of various human resource practitioners.

The specific research hypotheses in this study will include the relationships between stage of team development and important performance measurement, feedback, and reward practices on four types of team performance perceptions.

Hypothesis 1: More developmentally mature teams will report significantly higher perception of performance scale scores.

Hypothesis 1a: Teams in Performing stage of development will have significantly higher performance scale scores than teams in the Forming, Storming, and Norming stages of development.

Hypothesis 1b: Teams in the Norming stage of development will have significantly higher performance scale scores than teams in the Forming or Storming stages of development.

Hypothesis 2: Performance measurement at all four "levels" *(individual, team, business unit, organizational)* will be significantly associated with the highest perception of performance scale scores.

Hypothesis 3: Teams with at least three but less than fifteen total performance measures in their measurement system will report significantly higher perception of performance scale scores than teams with less than three or more than fifteen performance measures.

Hypothesis 4: Utilization of all four "types" of performance measures *(process/intangible skills, objective data/results, financial measures, customer satisfaction)* in a team measurement system will be significantly associated with higher perception of performance scale scores.

Hypothesis 5: Teams with the greatest degree of involvement in their performance management will report significantly higher perception of performance scale scores.

Hypothesis 5a: Greater degree of input into the design of the team measurement system will be associated with significantly higher perception of performance scale scores.

Hypothesis 5b: Greater degree of involvement in setting team measures, goals, and objectives will be associated with significantly higher perception of performance scale scores.

Hypothesis 5c: Greater degree of involvement in the actual appraisal of team performance will be associated with significantly higher perception of performance scale scores.

Hypothesis 6: Greater numbers of performance rater "levels" in the team measurement system will be associated with significantly higher perception of performance scale scores.

Hypothesis 7: Greater frequency of team measurement will be associated with significantly higher perception of performance scale scores.

Hypothesis 8: Performance feedback at all four "levels" *(individual, team, business unit, organizational)* will be associated with significantly higher perception of performance scale scores.

Hypothesis 9: Greater frequency of team performance feedback will be associated with significantly higher perception of performance scale scores.

Hypothesis 10: The utilization of team and business unit rewards will be associated with significantly higher perception of performance scale scores than the utilization of individual rewards.

Hypothesis 11: The utilization of both financial and non-financial rewards will be associated with significantly higher perception of performance scale scores compared to those teams receiving only one type of reward.

CHAPTER III

METHODOLOGY

Research Design

The purpose of this study is to examine the performance management processes and practices in R&D and similar technical-professional work teams. This level of work has been referred to as Knowledge Creation Systems and involves research and development by technical professionals such as engineers and scientists. While a few authors and practitioners have discussed the practices that should be implemented in team-based organizations, little is empirically known about what performance management practices are crucial to the success of knowledge work teams. While team-based measurement and feedback are undoubtedly important, an empirical model or set of guidelines for organizations implementing or revamping a measurement system would prove beneficial for the field of performance management. For this reason, it seems important to analyze current practices in order to determine what factors are meaningful or related to effectiveness in teams involved with complex knowledge work such as R&D.

The specific research design for this study is correlational in nature and will include team and organizational characteristics along with performance management processes in relation to team leader perceptions of performance. Tuckman's stages of

development will be utilized as an independent variable and will highlight the impact of developmental processes on perceptions of performance. More developed teams are expected to perform better than less developed teams. Measurement, feedback, and reward practices are also independent variables with the dependent variable being the four scales of the Perception of Team Performance measure. The design is intended to analyze and highlight the measurement, feedback, and reward practices of the most successful teams according to team leader perceptions. These practices will be investigated so that organizations who are new to teams or who have experienced team failures can emulate the performance management practices of successful teams in this study. This segment of organizational psychology continues to be an area where practice has led research. As the number of organizations utilizing knowledge teams continues to increase, the need for empirical research on performance management becomes more critical. Organizations have relied for too long on the art of performance measurement especially when it comes to knowledge work teams. This study seeks to analyze the critical factors of performance measurement, feedback, and rewards that relate to successful team performance so that this area of team practice will begin shifting from art to science.

Subjects

One hundred thirty-two R&D team leaders from 20 companies participated in this research study. These participants represented 10 specific types of industry. The sample included three team leaders from the communications industry, four from oil and gas, one from computing technology, one from consulting, two from pharmaceuticals, fifty-two

from chemical, nine from foods, thirty-one from electronics, eleven from agricultural, and twelve from manufacturing. Six team leaders classified their particular industry as "other." Companies were identified and asked to participate due to their affiliation with the Center for the Study of Work Teams at the University of North Texas. These affiliations were established via previous research projects sponsored by the center, the center's database of individuals interested in teaming, company representatives attending conferences sponsored by the center, advertisements at the center's conferences and Internet web site (www.workteams.unt.edu), and collaborative relationships with business and industry established by the project investigator. The specific survey respondents were designated leaders from R&D or similar technical-professional work teams. The sample represents various levels of experience and expertise with regards to team-based performance management. All but three participants were located in organizations across North America. Two respondents mailed the research survey to the project investigator while the bulk of the surveys were completed and submitted over the Internet at a designated web site (http://courses.unt.edu/kroberts/survey.html). Paper and pencil versions of the research survey were identical to the Internet surveys.

Measures

The survey instrument was developed based on research literature concerning team performance management and Roberts' (1998) exploratory study on the practices of measurement and rewards in knowledge work teams. This instrument can be seen in Appendix A. The survey included demographic data, specific organizational and team practices, and performance management information solicited from each participant

based upon his or her work with a particular R&D team and used as independent variables in this study. Information collected included the length of time the team has been together, the size of the team, business unit, and company as well as the particular type of industry. Participants were asked to specify whether their team is permanent and stable or temporary and assembled only for the duration of a project. Participants were then queried about how long they had utilized team-based performance measurement, what type of R&D work the team performs, and whether the team spends more time communicating via e-mail and telephone than through face-to-face discussions. The team leaders were also asked to identify their team's current stage of development or maturity based on Tuckman's (1965; 1977) model. These stages can be seen in Appendix B.

The remainder of the independent variables on the survey instrument included the team leader's perceptions of the specific performance measurement, feedback, and reward processes utilized with his or her respective team. The survey contained questions that inquire about the levels of measurement (individual, team, business unit, organization) involved in the team appraisal process, the complexity of the system, the specific number of performance measures utilized, and the types of measures (process skills, objective results, financial, external and internal customer satisfaction). Percentile ranks were utilized for items inquiring about the teams' degree of input into the design of their measurement system, degree of active participation in setting measures, goals, and objectives, and degree of team involvement in the actual assessment of performance. Participants selected from a list of potential raters (management, team leader, team, individual peers, internal customers, external customers, self, or others) in their

measurement system that are involved in the appraisal of their team's performance. Team leaders were also asked how often the team is appraised either formally or informally and how frequently the team receives either formal or informal performance feedback. Participants then specified the levels of performance feedback (individual, team, business unit, organizational) received. Specific items also addressed whether the team's system for performance management contained more business unit rewards, team rewards or individual rewards and whether team rewards were financial (merit raises, bonuses, etc), non-financial (recognition, plaques, parties, etc.), or a combination of both.

The dependent variable for this study included on the survey was a 20-item variation of Beyerlein's (1996, unpublished survey) Perceptions of Team Performance (PTP) scale that can been seen in Appendix C (Hall, 1998). Since performance management is indeed one of the most critical organizational support systems and significantly impacts subsequent performance, it is expected that successful teams can be identified through their specific performance management practices. To excel, teams must know how they are performing, and research literature has indicated that performance measurement is critically linked to success. With adequate appraisal, teams can continuously improve whereas team failures have often been traced to neglect or deficiencies in measurement processes. Michael Beyerlein, Sue Friedman, and Chris Hall developed the original Perceptions of Team Performance scale. Hall (1998) reports that previous analyses on the original Perceptions of Team Performance scale had adequate reliability for basic research. No validity analyses have been performed. Hall reports a principle component analysis on the original PTP scale resulted in a one-factor

solution accounting for 65.1% of the variance. Corrected item-total correlations ranged from .65 to .83. Alpha reliability for the scale was .94. These analyses were based on a sample of 194.

Hall's adapted version of the PTP scale was developed in order to evaluate subjects' perceptions of their team's effectiveness. He included all the original items from Beyerlein's original scale and added ten supplementary items based on additional team effectiveness literature. The scale is constructed so that one can collectively rate the team on 20 factors critical for success. The individual rates his or her team on a scale ranging from 0% effective to 100% effective on each of the 20 factors to indicate how well it is doing. After screening for multivariate outliers, Hall performed a factor analysis on the instrument. Four factors had eigenvalues greater than 1.0 for both principal components and principal axis extraction methods. Examination of eigenvalues using a scree plot suggested that a four-factor solution was most appropriate. Hall's four-factor solution accounted for 66.4% of the total variance. The four factor loadings suggest four kinds of team effectiveness: Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development. To compute a Perceptions of Team Performance index, each of the 20 scales is summed into a composite.

Customer Satisfaction Customer Satisfaction is composed of five items: meeting goals; creating quality products; satisfying customers; providing quality service to customers; and satisfying customer needs. These five items relate to the team's ability to create quality products and services as well as the team's ability to satisfy customer

requests. Customer satisfaction had an alpha reliability of .86, mean score of .82, and standard deviation of .12 based on 356 respondents (Hall, 1998).

Psychological Effectiveness Psychological Effectiveness is composed of four items: group member growth opportunities; trust with leaders and management; commitment to the organization; and satisfaction with the job. This factor appears to measure the extent that organizations create and meet psychological and/or emotional needs of team members. Psychological Effectiveness had an alpha reliability of .83, mean score of .70, and a standard deviation of .20 based on 373 respondents (Hall, 1998).

Team Effectiveness Team Effectiveness is composed of five items: group members' desire to work with the group in the future; group members satisfaction with the group versus frustration; problem-solving; decision-making; and belief in ability to perform jobs. These five items appear to tap the internal processes of the group such as the extent that working in the group is a productive and positive experience and the degree to which individuals work well together as a group. Team Effectiveness had an alpha reliability of .88, a mean score of .81, and a standard deviation of .14 based on 320 respondents (Hall, 1998).

Resource Utilization and Development Resource Utilization and Development is composed of six items: controlling costs; cycle time; innovation; increased capacity; use of expertise on the group; and increased production. These questions tap the extent to which groups use current resources effectively and the extent to which groups improve work processes. Resource Utilization and Development had an alpha reliability of .85, mean score of .75, and a standard deviation of .16 based on 340 respondents (Hall, 1998).

Procedures

This project follows an exploratory study on the measurement and reward practices utilized by 86 knowledge work teams in 27 organizations across North America (Roberts, 1998). Based on that study, this project was developed to examine the relationships between team performance management practices and perceptions of performance in R&D work teams from the team leader perspective. Organizational representatives from a variety of sources affiliated with the Center for the Study of Work Teams were contacted and informed about this study's purpose and asked to participate. Interested representatives were provided with both an optional consent form (Appendix C) and a required informed consent form (Appendix D) that acknowledged their organizations' willingness to participate in the research study. The representatives were then responsible for eliciting and obtaining the participation of their organizations' team leaders after returning consent forms to the project investigator. Twenty organizational representatives returned the completed consent forms and recruited team leaders from their site to complete the research survey.

The survey instrument was constructed so that it could be accessed and completed via the Internet or by conventional paper and pencil means. The specific survey respondents were 132 team leaders from the 20 companies who elected to participate. After submitting surveys, team leaders were made eligible for a variety of small participation prizes such as gift certificates, paperback books, or subscriptions to a business magazine. These various prizes were raffled off at several points in the data collection process. Organizational representatives received a two-page, preliminary

report on team performance management after returning a required consent form. At the conclusion of the project each organizational representative was provided with a summarized report on the results of the study including best practices. They were also provided with feedback about their teams' performance management practices and PTP scores relative to the other organizations in the study.

Data Analysis

The research hypotheses were generated from research literature and a prior exploratory study (Roberts, 1998) of team performance measurement practices in knowledge work teams. The integration of these sources was incorporated into a team performance measurement survey. The survey was designed to assess the relationship between team characteristics, stage of team development, measurement, feedback, and reward practices and the four factors of the Perceptions of Team Performance measure. The field has produced a scarcity of empirical research concerning team performance management processes for knowledge work so this data was analyzed in order to examine the relationships between important practices and perceptions of performance in R&D team work. Each hypothesis contained predictions concerning important team characteristics or relevant performance measurement, feedback, or reward practices that were analyzed in relation to the four scales of the Perception of Team Performance measure. These scales have been identified as Psychological Effectiveness, Team Effectiveness, Customer Satisfaction, and Resource Utilization and Development.

Hypotheses 1a and 1b were analyzed with a One Way, 4 X 4 Multivariate Analysis of Variance utilizing the first four stages of team development and their relationship to the four scales of the PTP.

Hypothesis 2 was analyzed using four Stepwise Regression analyses in order to discover the "levels" of measurement that best predicts the four scales of the PTP.

Hypothesis 3 was analyzed using a One Way, 2 X 4 Multivariate Analysis of Variance comparing teams with less than three or more than 15 performance measures with teams using between three and 15 measures on the four scales of the PTP.

Hypothesis 4 was analyzed using Canonical Correlation to reveal what "types" of measures in a team measurement system are associated with the four scales of the PTP.

Hypotheses 5a, 5b, and 5c were analyzed using Canonical Correlation to discover the association between the four scales of the PTP and the degree of team involvement in system design, setting measures, goals, and objectives, and participation in appraisal.

Hypothesis 6 was analyzed using Pearson correlation analyses to find the relationship between the number of performance rater levels utilized in a team measurement system and the four scales of the PTP.

Hypothesis 7 was analyzed using Pearson correlation analyses to predict the four scales of the PTP by the frequency of team performance measurement.

Hypothesis 8 was analyzed with Point-Biserial correlation analyses to find the relationships between the four "levels" of performance feedback and the four scales of the PTP.

Hypothesis 9 was analyzed using Pearson correlation analyses in order to find the associations between the four scales of the PTP and the frequency of team performance feedback.

Hypothesis 10 was analyzed with a One Way, 3 X 4 Multivariate Analysis of Variance to discover the effects of individual rewards, team rewards, and business unit rewards on the four scales of the PTP.

Hypothesis 11 was analyzed with a One Way, 3 X 4 Multivariate Analysis of Variance comparing teams that receive financial rewards, non-financial rewards, or both types of rewards with the four scales of the PTP.

CHAPTER IV

RESULTS

Preliminary Analyses

Preliminary Results for Demographics

Frequency and descriptive statistical analyses were performed on demographic, independent, and dependent variables examined in the study. Table 1 presents the descriptive statistics on the important organizational and team characteristics of the sample. The mean population of the team leaders' work sites was 1,527 but there was tremendous variation in populations with the lowest population having 8 people and the highest having 18,000. The mean population of the R&D population was 332, but again substantial variability was present on this variable. Mean size of the teams in this sample was 10.2 and the mean chronological age of the teams was 25.3 months. One response was missing from Size of Teams and Age of Teams.

Table 1.

Means, Standard Deviations, and Ranges of Selected Organizational and Team Characteristics

Variable	Mean	SD	Min.	Max.	Number of Teams
Work Site Population	1527.4	2540.2	8.0	18000.0	132
R&D Population	332.2	355.7	0.0	1290.0	132
Size of Teams	10.2	6.3	2.0	33.0	131
Age of Teams (Months)	25.3	30.7	1.0	240.0	131

Table 2 presents the frequency results for team characteristics. Thirty-three teams (25%) performed basic research, 98 teams (69.5%) performed applied research, and 109 (82.6%) performed development research. Frequency statistics revealed that 43 teams in the sample (32.6%) were considered temporary project teams and 88 teams (66.7%) were classified as permanent, stable teams. Twenty-five teams (18.9%) were considered virtual teams and 105 (79.5%) worked primarily face-to-face.

Table 2.

Frequency Distribution of Team Characteristics

Variable and Value Label	Frequency	Percent	Valid %	Cumulative %
Basic Research				
NO	98	74.2	74.8	74.8
YES	33	25.0	25.2	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Applied Research				
NO	40	30.3	30.5	30.5
YES	91	68.9	69.5	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Development Research				
NO	22	16.7	16.8	16.8
YES	109	82.6	83.2	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Project Team	43	32.6	32.8	32.8
Stable Team	88	66.7	67.2	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Virtual Team	25	18.9	19.2	19.2
Face-to-Face Team	105	79.5	80.8	100.0
Missing	2	1.5	-	
Total	132	100.0	100.0	

Preliminary Results for Hypothesis 1

Table 3 represents frequency results for stage of team development. Two teams (1.5%) were reported to be in the Forming stage, 13 teams (9.8%) were reported in the Storming stage, 50 teams (37.9%) were reported in the Norming stage, and 62 teams (47%) were reported in the Performing stage. Four teams (3%) were reported to be in the Adjourning stage and one response was missing (0.8%).

Table 3.

Frequency Distribution for Stage of Team Development

Value Label	Frequency	Percent	Valid %	Cumulative %
Forming	2	1.5	1.5	1.5
Storming	13	9.8	9.9	11.5
Norming	50	37.9	38.2	49.6
Performing	62	47.0	47.3	96.9
Adjourning	4	3.0	3.1	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypotheses 2, 3, and 4

Table 4 presents frequency results for levels of performance measurement and types of performance measures reported by teams in the sample. One hundred fifteen teams (87.1%) had individual employee performance measurement, 93 teams (70.5%) had team level performance measurement, 62 teams (47.0%) had business unit performance measurement, and 45 teams (34.1%) had organizational performance measurement. The mean number of performance measures utilized by teams was 4.79 (SD = 3.77). Sixty-eight teams (51.5%) had process skill or intangible measures, 117

teams (88.6%) utilized objective, result-oriented measures, 56 teams (42.4%) utilized financial performance measures, and 86 teams (65.2) utilized customer satisfaction measures.

Table 4.

Frequency Distribution for Levels of Performance Measurement and Types of Performance Measures

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Individual Measurement				
NO	16	12.1	12.2	12.2
YES	115	87.1	87.8	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Team Measurement				
NO	38	28.8	29.0	29.0
YES	93	70.5	71.0	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Business Unit Measurement				
NO	69	52.3	52.7	52.7
YES	62	47.0	47.3	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Organizational Measurement				
NO	86	65.2	65.6	65.6
YES	45	34.1	34.4	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Process/Intangible Measures				
NO	63	47.7	48.1	48.1
YES	68	51.5	51.9	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Objective/Result Measures				
NO	13	9.8	10.0	10.0
YES	117	88.6	90.0	100.0
Missing	2	1.5	-	
Total	132	100.0	100.0	
Financial Measures				
NO	75	56.8	57.3	57.3
YES	56	42.4	42.7	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Customer Satisfaction Measures				
NO	45	34.1	34.4	34.4
YES	86	65.2	65.6	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypothesis 5

Descriptive results for the level of team involvement in the design of the performance measurement system, setting measures goals and objectives, and involvement in the appraisal process itself were next calculated. Level of involvement was rated by team leaders on a scale from 0% (no involvement) to 100% (total involvement) based on their respective team's degree of participation. Teams had a mean level of involvement in system design of 21.82% (SD = 29.78), the mean level of team involvement for setting performance measures, goals, and objectives was 56.58% (SD =

31.43), and the mean level of involvement in the appraisal process itself was 32.54% (SD = 30.49).

Preliminary Results for Hypothesis 6

The mean number of performance rater levels utilized in team performance measurement systems was 3.2 (SD = 1.70). Only one team reported having no performance raters; the remaining teams had between one and eight levels, with just under 80% having four or less (see Table 5).

Table 5.

Frequency Distribution for Number of Performance Rater Levels

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Number of Performance Rater Levels				
0	1	0.8	0.8	0.8
1	16	12.1	12.2	13.0
2	37	28.0	28.2	41.2
3	28	21.2	21.4	62.6
4	22	16.7	16.8	79.4
5	14	10.6	10.7	90.1
6	6	4.5	4.6	94.7
7	4	3.0	3.1	97.7
8	3	2.3	2.3	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypothesis 7

Table 6 presents the distribution for frequency of team performance measurement. Seven teams (5.3%) reported no performance measurement, 18 teams (13.6%) reported

irregular performance appraisal, 33 teams (25%) reported performance measurement on an annual basis, nine teams (6.8%) reported semi-annual performance measurement, and the rest of the sample endorsed a more frequent performance appraisal.

Table 6.

Frequency Distribution for Frequency of Team Performance Measurement

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Frequency of Team Performance Measurement				
Never	7	5.3	5.3	5.3
Irregular	18	13.6	13.7	19.1
Annual	33	25.0	25.2	44.3
Semi-Annual	9	6.8	6.9	51.1
Quarterly	17	12.9	13.0	64.1
2 Months	1	0.8	0.8	64.9
Monthly	15	11.4	11.5	76.3
2 Weeks	10	7.6	7.6	84.0
Weekly	13	9.8	9.9	93.9
Project Milestones	7	5.3	5.3	99.2
Other	1	0.8	0.8	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypothesis 8

The results for the levels of performance feedback provided can be seen in Table 7. One hundred and two teams (77.3%) reported receiving individual, team member performance feedback, 99 teams (75%) reported receiving team-level performance feedback, 32 teams (24.2%) reported receiving business unit performance feedback, 19

teams (14.4%) reported that they received organizational performance feedback information.

Table 7.

Frequency Distribution for Levels of Performance Feedback

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Individual Feedback				
NO	29	22.0	22.1	22.1
YES	102	77.3	77.9	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Team Feedback				
NO	32	24.2	24.4	24.4
YES	99	75.0	75.6	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Business Unit Feedback				
NO	99	75.0	75.6	75.6
YES	32	24.2	24.4	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	
Organizational Feedback				
NO	112	84.8	85.5	85.5
YES	19	14.4	14.5	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypothesis 9

The results for the frequency of team-level performance feedback are presented in Table 8. Two teams (1.5%) did not receive performance feedback, 35 teams (26.5%) received irregular performance feedback, 25 teams (18.9%) received annual performance feedback, six teams (4.5%) received semi-annual feedback, and the remaining teams reported getting feedback more frequently.

Table 8.

Frequency Distribution for Frequency of Team Performance Feedback

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Frequency of Team Performance Feedback				
Never	2	1.5	1.5	1.5
Irregular	35	26.5	26.7	28.2
Annual	25	18.9	19.1	47.3
Semi-Annual	6	4.5	4.6	51.9
Quarterly	19	14.4	14.5	66.4
2 Months	1	0.8	0.8	67.2
Monthly	9	6.8	6.9	74.0
2 Weeks	9	6.8	6.9	80.9
Weekly	17	12.9	13.0	93.9
Project Milestones	7	5.3	5.3	99.2
Other	1	0.8	0.8	100.0
Missing	1	0.8	-	
Total	132	100.0	100.0	

Preliminary Results for Hypotheses 10 and 11

Eighty-four teams (63.6%) reported the most common rewards were individual, 38 teams (28.8%) reported that the most common rewards were team-based, five teams (3.8%) reported business unit rewards were most common, and five responses were missing (3.8%). Forty-six teams (34.8%) received only financial rewards, 45 (34.1%) received only non-financial rewards, and 39 teams (29.5%) of the sample received both financial and non-financial types of rewards. .

Preliminary Results for the Dependent Variables

In Table 9 the descriptive results are presented for each of the 20 items of the Perception of Team Performance Scale. The minimum score was 0% and the maximum score was 100% for each of the 20 items in the scale. The lowest score was on the Growth Opportunities item (M = 58.42%, SD = 26.42%) and the highest on the team's belief in their ability (M = 82.26%, SD = 18.18%). On 15 of the items (75%) scores exceeded 70%. Items with scores lower than this included Cycle Time (M = 65.43%, SD = 23.99%), Increased Capacity (M = 62.79%, SD = 28.41%), production growth (M = 62.65%, SD = 29.48%), management commitment (M = 61.71%, SD = 23.96), and the aforementioned growth opportunities. Variability was present on all of the items. Cycle Time, Increased Capacity, and Increased Production had missing responses.

Table 9.

Means, Standard Deviations, and Ranges for the 20 Items of the

Perception of Team Performance Scale

Variable	Mean	SD	Min.	Max.	Valid Number of Teams
Controlling Costs	71.57	27.47	0.0	100.0	132
Goal Achievement	76.70	19.04	0.0	100.0	132
Cycle Time	65.43	23.99	0.0	100.0	129
Quality Products	78.14	20.20	0.0	100.0	132
Innovation	70.79	22.85	0.0	100.0	132
Increased Capacity	62.79	28.41	0.0	100.0	129
Use of Expertise	77.70	19.45	0.0	100.0	132
Customer Satisfaction	73.37	20.91	0.0	100.0	132
Quality of Service to Customers	76.61	22.56	0.0	100.0	132
Response to Customers	78.74	21.00	0.0	100.0	132
Team Desire to Work Together	77.65	19.32	0.0	100.0	132
Team Satisfaction with One Another	76.86	17.58	0.0	100.0	132
Problem-Solving	77.44	19.40	0.0	100.0	132
Decision-Making	74.00	20.96	0.0	100.0	132
Team Belief in their Ability	82.23	18.18	0.0	100.0	132
Increased Production	62.65	29.48	0.0	100.0	130
Growth Opportunities	58.42	26.42	0.0	100.0	132
Trust in Management	61.71	23.96	0.0	100.0	132
Commitment to the Organization	77.10	19.70	0.0	100.0	132
Team Satisfaction With the Job	74.37	18.58	0.0	100.0	132

Table 10 presents the descriptive statistics correlations for each of the four factors of the Perception of Team Performance Scale both before and after truncation of an outlier. The one outlier that was present had standardized scores on all of the scales that exceeded three standard deviations from the mean. Inspection of the raw scores indicated that this was due to the individual endorsing zeros on all of the items. This outlier was truncated to one point above the next outlying value (Tabachnick & Fidell, 1996). Overall the removal of the outlier had relatively little influence on the central tendency or dispersion of the scale scores. The Psychological Effectiveness and Resource Utilization and Development scales had the lowest mean scores and the means of the Team Effectiveness and Customer Satisfaction scales were very similar to each other. Skewness and kurtosis statistics were also calculated for each of these scales to determine the extent to which they adhered to a normal distribution. These values indicated that all variables were substantially negatively skewed. Square root transformations after reflection successfully normalized all variables. The square root values were reflected back by subtracting the scores from one plus the lowest value so that higher scores would indicate a higher endorsement of the scale dimension (Tabachnick & Fidell, 1996). All analyses were conducted with these transformed values.

Table 10.

Means, Standard Deviations, and Ranges for the Four Factors of the Perception of Team Performance Scale with Outlier Included

Variable	Mean	SD	Min.	Max.	Valid Number of Teams
Before Removal of Outlier					
Psychological Effectiveness	67.90	18.30	0.0	100.0	132
Team Effectiveness	77.64	15.96	0.0	100.0	132
Customer Satisfaction	76.72	16.97	0.0	100.0	132
Resource Utilization and Development	68.49	17.57	0.0	98.33	132
After Removal of Outlier					
Psychological Effectiveness	68.04	17.84	17.50	100.0	131
Team Effectiveness	77.72	15.61	9.0	100.0	131
Customer Satisfaction	76.90	16.23	24.0	100.0	131
Resource Utilization and Development	68.62	17.12	15.83	98.33	131

Intercorrelations among Variables

Correlation coefficients between the variables were next calculated and are presented in Tables 11 and 12. Pearson coefficients between the four dependent variables indicated that all variables were significantly correlated with one another, with the average being .60. The lowest correlation was between Customer Satisfaction and Psychological Effectiveness, $r(131) = .45$, $p < .001$, and the highest correlation was

between Customer Satisfaction and Resource Utilization and Development, $r(131) = .71$, $p < .001$.

Table 11.

Pearson Correlations Between PTP Scales

	Customer Satisfaction	Psychological Effectiveness	Team Effectiveness	Resource Util. & Develop.
Customer Satisfaction	1.00	.45***	.59***	.71***
Psychological Effectiveness		1.00	.64***	.64***
Team Effectiveness			1.00	.58***
Resource Util. and Develop.				1.00

*** $p < .001$

Analyses were next conducted to determine the extent to which all of the variables were associated with each other. This exploratory correlation matrix is shown in Table 12.

Table 12.

Intercorrelations among Variables in the Study

Variable	1.	2.	3.	4.	5.	6.	7.
1. Customer Satisfaction	--						
2. Psych. Effectiveness	.45***	--					
3. Team Effectiveness	.59***	.64***	--				
4. Resource Utilization & Devel.	.71***	.64***	.58***	--			
5. No. Employees at Site	.12	.09	.06	.14	--		
6. No. Employees in R&D	.09	.11	.08	.06	.49***	--	
7. No. Employees in Team	.02	.02	.00	.09	.12	.12	--
8. Basic Research	-.01	.12	.12	.03	-.14	-.17	.13
9. Applied Research	-.01	-.16	-.09	-.06	-.15	-.41***	.01
10. Development Research	.00	.07	.17	.02	.15	.17*	.29**
11. Type of Team	.04	-.03	.11	.05	.09	-.17	.11
12. Individual Measurement	.20*	.03	.24**	.15	.07	.13	-.23**
13. Team or Project Measurement	.13	.13	.16	.03	.07	.06	.27**
14. Business Unit Measurement	.26**	.18*	.32***	.14	.13	.15	.13
15. Organization Measurement	.12	.03	.15	.01	.16	.19*	.19*
16. Process Measures	.16	.08	.08	.02	.03	-.16	-.13
17. Result Measures	.17*	.17	.12	.17	-.08	-.10	.23**
18. Financial Measures	.03	-.12	.02	-.07	.00	.09	.11
19. External Cust. Satis. Measures	.08	-.05	.01	-.13	-.06	.12	.04
20. Internal Cust. Satis. Measures	.30***	.11	.17	.22*	-.02	-.09	-.06
21. No. of Performance Measures	.14	.20*	.03	.06	-.05	-.07	.05
22. Involvement in Design	.11	.23**	.32***	.01	-.08	-.07	.11
23. Involvement in Setting	.19*	.22**	.39***	.21*	-.12	-.14	-.04
24. Involvement in Appraisal	.18*	.29***	.33***	.12	-.02	-.02	.06
25. Rating Level	.16	.27**	.32***	.16	-.03	.02	.05
26. How Often Measured	.19*	.33***	.35***	.21*	.13	.04	.18
27. Individual Feedback	.09	-.03	.15	.05	-.04	-.11	-.06
28. Team or Project Feedback	.01	.12	.09	-.05	.02	.04	.26**
29. Business Unit Feedback	.04	-.03	.12	-.01	.09	.17*	.06
30. Organizational Feedback	-.13	-.10	-.06	-.16	.16	.13	.17*
31. Feedback Frequency	.26**	.18	.31**	.23**	-.07	-.04	.10
32. Rewards Dispensed	.04	.15	.01	-.02	-.03	.23**	-.03
33. Type of Rewards	-.08	.03	-.14	-.08	-.15	-.03	.30**
34. Interdependence	.26**	.39***	.46***	.34***	.17	.14	.12

Table 12. (continued)

Variable	8.	9.	10.	11.	12.	13.	14.
1. Customer Satisfaction							
2. Psych. Effectiveness							
3. Team Effectiveness							
4. RUD							
5. No. Employees at Site							
6. No. Employees in R&D							
7. No. Employees in Team							
8. Basic Research	--						
9. Applied Research	.27**	--					
10. Development Research	.12	-.17	--				
11. Type of Team	.07	.14	.08	--			
12. Individual Measurement	-.11	.06	-.04	.19*	--		
13. Team or Project Measurement	.10	.09	.25**	.09	.02	--	
14. Business Unit Measurement	.08	-.24**	.26**	.11	.07	.24**	--
15. Organization Measurement	.14	-.04	.24**	.20*	.12	.25**	.54***
16. Process Measures	.17	.09	-.07	.14	.15	.13	-.01
17. Result Measures	.08	.28***	.06	.09	-.05	.24**	-.05
18. Financial Measures	.00	-.06	.26**	-.02	.04	.21*	.32***
19. External Cust. Satis. Measures	-.05	-.09	.15	.06	.14	.39 ***	.19*
20. Internal Cust. Satis. Measures	.05	.13	-.07	.14	.21*	.20*	.02
21. No. of Performance Measures	.10	.03	-.02	.14	-.11	.27*	.19*
22. Involvement in Design	.16	.03	.01	.05	-.11	.26**	.03
23. Involvement in Setting	.15	.07	.00	-.13	.03	.03	.00
24. Involvement in Appraisal	.07	.00	.13	.06	-.02	.27*	.07
25. Rating Level	.18*	-.06	.10	-.02	.11	.31 ***	.26**
26. How Often Measured	-.05	.02	.13	.11	.10	.31 ***	.12
27. Individual Feedback	.06	.09	-.04	.14	.36***	-.02	-.08
28. Team or Project Feedback	.08	.09	.22*	-.02	.06	.58 ***	.08
29. Business Unit Feedback	-.04	-.09	.21*	-.02	.05	-.03	.35***
30. Organizational Feedback	.06	-.06	.19*	.24**	-.05	.07	.09
31. Feedback Frequency	-.04	.08	.09*	.17	.13	.23*	.15
32. Rewards Dispensed	.09	-.23**	.05	-.27**	-.14	.14	.17
33. Type of Rewards	.08	.12	.05	.04	-.02	.28**	-.05
34. Interdependence	.12	.03	.14	-.06	-.06	.15	.07

Table 12. (Continued)

Variable	15.	16.	17.	18.	19.	20.	21.
1. Customer Satisfaction							
2. Psych. Effectiveness							
3. Team Effectiveness							
4. RUD							
5. No. Employees at Site							
6. No. Employees in R&D							
7. No. Employees in Team							
8. Basic Research							
9. Applied Research							
10. Development Research							
11. Type of Team							
12. Individual Measurement							
13. Team or Project Measurement							
14. Business Unit Measurement							
15. Organization Measurement	--						
16. Process Measures	-.11	--					
17. Result Measures	.08.	-.02	--				
18. Financial Measures	.29**	-.06	-.03	--			
19. External Cust. Satis. Measures	.21*	.07	.09	.36***	--		
20. Internal Cust. Satis. Measures	.12	.33***	.21*	.08	.16	--	
21. No. of Performance Measures	.03	.29***	.20*	-.01	.24**	-.05	--
22. Involvement in Design	-.04	.16	.20*	.02	.10	.17*	.09
23. Involvement in Setting	-.15	.21*	.26**	-.08	-.08	.24**	-.01
24. Involvement in Appraisal	-.02	.26**	.23**	.02.	.12	.21*	.11
25. Rating Level	.26**	.20*	.14	.30***	.12	.27**	.04
26. How Often Measured	.11	-.05	.12	.06	.07	.14	.20*
27. Individual Feedback	-.16	.30***	.19*	-.06	.02	.03	.10
28. Team or Project Feedback	.08	.13	.23**	.24**	.36***	.15	.15
29. Business Unit Feedback	.19*	.12	-.05	.26**	.15	.07	-.05
30. Organizational Feedback	.43***	-.04	-.01	.13	-.01	-.04	-.05
31. Feedback Frequency	.10	.02	.06	.05	.11	.15	.17
32. Rewards Dispensed	.07	-.10	-.17	.20*	.13	-.13	.11
33. Type of Rewards	.09	.03	.18*	.06	.19*	.22**	.04
34. Interdependence	.02	.04	.16	-.05	.07	.06	.12

Table 12. (continued)

Variable	22.	23.	24.	25.	26.	27.	28.
1. Customer Satisfaction							
2. Psych. Effectiveness							
3. Team Effectiveness							
4. RUD							
5. No. Employees at Site							
6. No. Employees in R&D							
7. No. Employees in Team							
8. Basic Research							
9. Applied Research							
10. Development Research							
11. Type of Team							
12. Individual Measurement							
13. Team or Project Measurement							
14. Business Unit Measurement							
15. Organization Measurement							
16. Process Measures							
17. Result Measures							
18. Financial Measures							
19. External Cust. Satis. Measures							
20. Internal Cust. Satis. Measures							
21. No. of Performance Measures							
22. Involvement in Design	--						
23. Involvement in Setting	.41***	--					
24. Involvement in Appraisal	.46***	.44***	--				
25. Rating Level	.17	.18*	.38***	--			
26. How Often Measured	.15	.06	.22*	.23*	--		
27. Individual Feedback	-.08	.10	.01	.18*	.02	--	
28. Team or Project Feedback	.26**	.10	.31***	.31***	.22*	-.13	--
29. Business Unit Feedback	.06	.06	.12	.30***	.02	.05	.08
30. Organizational Feedback	.07	-.23**	.01	.08	.06	-.15	-.02
31. Feedback Frequency	.01	.17	.23*	.12	.58***	.14	.14
32. Rewards Dispensed	.08	-.03	-.01	-.02	-.10	-.23**	.25**
33. Type of Rewards	-.11	-.08	-.02	.19*	.07	.10	.25**
34. Interdependence	.17	.22*	.17	.24*	.22*	.06	.09

Table 12 (continued)

Variable	29.	30.	31.	32.	33.	34.
1. Customer Satisfaction						
2. Psych. Effectiveness						
3. Team Effectiveness						
4. RUD						
5. No. Employees at Site						
6. No. Employees in R&D						
7. No. Employees in Team						
8. Basic Research						
9. Applied Research						
10. Development Research						
11. Type of Team						
12. Individual Measurement						
13. Team or Project Measurement						
14. Business Unit Measurement						
15. Organization Measurement						
16. Process Measures						
17. Result Measures						
18. Financial Measures						
19. External Cust. Satis. Measures						
20. Internal Cust. Satis. Measures						
21. No. of Performance Measures						
22. Involvement in Design						
23. Involvement in Setting						
24. Involvement in Appraisal						
25. Rating Level						
26. How Often Measured						
27. Individual Feedback						
28. Team or Project Feedback						
29. Business Unit Feedback	--					
30. Organizational Feedback	.22*	--				
31. Feedback Frequency	-.01	.06	--			
32. Rewards Dispensed	.23**	-.05	-.16	--		
33. Type of Rewards	.08	.00	.04	.08	--	
34. Interdependence	-.11	.02	.31***	-.18	-.04	--

Inferential Analyses

Hypothesis 1: Stage of Team Development and PTP

The first hypothesis (H1a) predicted teams in the Performing stage of development would have higher PTP scale scores than teams in the Forming, Storming, and Norming stages. The second hypothesis (H1b) predicted that teams in the Norming stage of development would have higher PTP scale scores than teams in the Forming or Storming stages. These hypotheses were tested with SPSS one-way multivariate analysis of variance (MANOVA) using team development as the between subjects factor and Psychological Effectiveness, Team Effectiveness, Customer Satisfaction, and Resource Utilization and Development as the dependent variables. The means analyzed for this hypothesis are presented in Table 13. The Forming stage consisted of two teams; the Storming stage had 13 teams; the Norming stage had 50 teams; and the Performing stage had 62 teams. Due to only two cases in the Forming stage the analysis was limited in its ability to make distinctions between the stages for each dependent variable.

Wilks' Lambda test of significance revealed the linear combination of the four dependent variables significantly discriminated between the Forming, Storming, Norming, and Performing stages. $\lambda = 0.69$, $F(12, 317.78) = 3.96$, $p < .001$. This multivariate analysis can be seen in Table 14. The dependent variable, Customer Satisfaction significantly discriminated between the four stages of team development. $F(3, 123) = 7.44$, $p < .001$, $\eta^2 = .15$. Psychological Effectiveness significantly discriminated between the four stages. $F(3, 123) = 12.90$, $p < .001$, $\eta^2 = .24$. Team Effectiveness significantly discriminated between the four stages. $F(3, 123) = 13.19$, $p <$

.001, $\eta^2 = .24$. Resource Utilization and Development also significantly discriminated between the four stages of team development. F (3, 123) = 7.40, p < .001, $\eta^2 = .15$. These univariate analyses can be seen in Table 15.

Table 13.

Descriptive Statistics on Dependent Variables across Stages

Dependent Variable	Forming (n = 2)	Storming (n = 13)	Norming (n = 50)	Performing (n = 62)
Psychological Effectiveness				
Mean	5.55	3.08	4.17	5.32
SD	1.54	1.79	1.15	1.44
Team Effectiveness				
Mean	6.49	4.71	5.48	6.74
SD	1.55	1.30	1.39	1.27
Customer Satisfaction				
Mean	5.57	4.10	4.63	5.74
SD	2.66	1.60	1.48	1.45
Resource Utilization and Development				
Mean	5.59	3.62	4.45	5.42
SD	0.63	1.48	1.28	1.64

Table 14.

MANOVA Test of Significance for Stage of Team Development and the Linear Combination of the Four PTP Scales

Effect	λ	F	df	η^2
Stage of Development	.69	3.96***	12, 317.78	.12
Intercept	.18	140.14***	4, 120	.82

*** p < .001

Table 15.

ANOVA Test of Significance for Stage of Team Development and the Four Scales of PTP

PTP Variable	df	MS	F	η^2
Customer Satisfaction	3	16.60	7.44***	.15
Psychological Effectiveness	3	24.31	12.90***	.24
Team Effectiveness	3	23.24	13.19***	.24
Resource Utilization and Development	3	16.34	7.40***	.15

*** p < .001

Pairwise Comparisons between stages of team development testing Hypothesis 1a and 1b can be seen in Table 16. Fisher's Least Significant Difference Test revealed that teams in the Performing stage of development had significantly greater Customer Satisfaction than teams in the Norming (Mean Difference = 1.11, p < .001) and Storming

(Mean Difference = 1.64, $p < .001$) stages. However, teams in the Performing stage did not significantly differ from teams in the Forming stage ($p = .868$). These analyses partially support H1a on the Customer Satisfaction measure. However, teams in the Norming stage were not significantly different from those in either the Storming stage ($p = .257$) or Forming stage ($p = .388$). These analyses do not support H1b on the Customer Satisfaction measure.

For the measure Psychological Effectiveness, Fisher's Least Significant Difference Test revealed that teams in the Performing stage were significantly more effective than teams in the Norming (Mean Difference = 1.15, $p < .001$) and Storming stages (Mean Difference = 2.24, $p < .001$); however, teams in the Performing stage did not significantly differ from teams in the Forming stage ($p = .817$). These analyses partially support H1a on the Psychological Effectiveness measure. Teams in the Norming stage were significantly more effective than teams in the Storming stage (Mean Difference = 1.06, $p < .012$) but not significantly different from teams in the Forming stage ($p = .166$). These analyses partially support H1b on the Psychological Effectiveness measure.

On the Team Effectiveness measure, tests of significance revealed that teams in the Performing stage were significantly more effective than teams in the Norming (Mean Difference = 1.26, $p < .001$) and Storming stages (Mean Difference = 2.04, $p < .001$). However, teams in the Performing stage did not significantly differ from teams in the Forming stage ($p = .792$). These analyses only partially support H1a. Teams in the Norming stage did not differ significantly from teams in the Storming ($p = .063$) or

Forming stages (p = .294). These analyses do not support H1b for the Team Effectiveness measure.

Fisher's Test also revealed that teams in the Performing stage were significantly higher on the Resource Utilization and Development measure than teams in the Norming (Mean Difference = 0.97, p < .001) and Storming stages (Mean Difference = 1.80, p < .001), yet teams in the Performing stage did not significantly differ from teams in the Forming stage (p = .873). These analyses partially support H1a on the Resource Utilization and Development measure. Teams in the Norming stage were not significantly different from teams in either the Storming (p = .074) or Forming stages (p = .289). These analyses do not support H1b on the Resource Utilization and Development measure.

Table 16.

Pairwise Comparisons between Stages of Team Development for Each Scale of the PTP

PTP Variable	Stage	Stage	Mean Difference	Std. Error
Customer Satisfaction				
	Performing	Norming	1.11***	.28
	Performing	Storming	1.64***	.46
	Performing	Forming	0.18	1.07
	Norming	Storming	0.53	.47
	Norming	Forming	-0.93	1.08
Psychological Effectiveness				
	Performing	Norming	1.15***	.26
	Performing	Storming	2.24***	.42
	Performing	Forming	-0.23	.99
	Norming	Storming	1.06*	.43
	Norming	Forming	-1.38	.99
Team Effectiveness				
	Performing	Norming	1.26***	.25
	Performing	Storming	2.04***	.41
	Performing	Forming	0.25	.95
	Norming	Storming	0.78	.41
	Norming	Forming	-1.01	.96
Resource Utilization and Development				
	Performing	Norming	0.97**	.28
	Performing	Storming	1.80***	.45
	Performing	Forming	0.26	.96
	Norming	Storming	0.83	.46
	Norming	Forming	-1.14	1.07

***$p < .001$, **$p < .01$, *$p < .05$

Hypothesis 2: Levels of Measurement and PTP

The second hypothesis (H2) predicted that performance measurement at the individual, team, business unit, and organizational level would be associated with the highest PTP scale scores. This hypothesis was tested with four SPSS forward stepwise regression analyses using Individual Measurement, Team Measurement, Business Unit Measurement, and Organizational Measurement as the predictor for each analysis and Psychological Effectiveness, Team Effectiveness, Customer Satisfaction, and Resource Utilization and Development as the dependent variables. It was observed that Business Unit Measurement was highly significant with Team Effectiveness, $p < .001$. Table 17 summarizes the relationships between the independent and dependent variables used in this analysis. Table 18 summarizes the results of the regression analyses.

Table 17.

Pearson Correlations Between Levels of Measurement and PTP Scales

	Customer Satisfaction	Psychological Effectiveness	Team Effectiveness	Resource Util. & Develop.
Individual Measurement	.20*	.03	.24**	.15*
Team Measurement	.13	.13	.16*	.03
Business Unit Measurement	.26**	.18*	.32***	.14
Organizational Measurement	.12	.03	.15*	.01

*** $p < .001$, ** $p < .01$, * $p < .05$

Table 18.

Forward Stepwise Regression Analyses Predicting Levels of Performance

Model	R^2	df	F
Customer Satisfaction			
Business Unit			
Measurement	.07	1, 130	9.41**
Individual			
Measurement	.03	1, 129	4.60*
Psychological Effectiveness			
Business Unit			
Measurement	.03	1, 130	4.48*
Team Effectiveness			
Business Unit			
Measurement	.10	1, 130	14.69***
Individual			
Measurement	.05	1, 129	7.30**
Resource Utilization and Development			
(No significant predictors)			

***p < . 001. **p < . 01. *p < .05

In the first forward stepwise regression analysis Customer Satisfaction served as the outcome variable. In step one Business Unit Measurement was entered and explained 7% of the variance, $F(1, 130) = 9.41$, $p < .01$. Individual Measurement was entered in step two and explained an additional 3.2% of the variance, $F(1, 129) = 4.59$, $p < .05$. None of the other variables were added to the regression equation. Together, these two variables explained 10% of the variance in Customer Satisfaction, $R^2 = .10$, $F(2, 129) =$

7.13, $p < .01$. This analysis only partially supports the hypothesis for Customer Satisfaction.

In the second forward stepwise regression analysis Psychological Effectiveness served as the outcome variable. Business Unit Measurement was entered in step one of the equation and explained 3% of the variance, $F(1, 130) = 4.48$, $p < .05$. None of the other variables were added to the regression equation. Therefore, only 3% of the variance in Psychological Effectiveness was explained. This analysis only partially supports the hypothesis for Psychological Effectiveness.

In the third forward stepwise regression analysis Team Effectiveness served as the outcome variable. In step one Business Unit Measurement was entered and explained 10% of the variance, $F(1, 130) = 14.69$, $p < .001$. Individual Measurement was entered in step two and explained an additional 5% of the variance, $F(1, 129) = 7.30$, $p < .01$. None of the other variables were added to the regression equation. Together, these two variables explained 15% of the variance in Team Effectiveness, $R^2 = .15$, $F(2, 129) = 11.35$, $p < .001$. This analysis only partially supports the hypothesis for Team Effectiveness.

In the fourth forward stepwise regression analysis Resource Utilization and Development served as the outcome variable. None of the measurement variables significantly predicted the dependent variable and were not added to the regression equation. Therefore, this analysis does not support the hypothesis for Resource Utilization and Development.

Hypothesis 3: Number of Performance Measures and PTP

The third hypothesis (H3) predicted that teams with three to 15 performance measures would have the highest PTP scale scores. This hypothesis was tested with SPSS one-way, two-group multivariate analysis of variance (MANOVA) using teams with less than 3 or more than 15 measures as one between-subjects level and teams with between 3 and 15 measures as the other level. Eighty-nine teams (67%) utilized between 3 and 15 performance measures and 43 teams (33%) had either less than 3 performance measures or more than 15. Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development served as the dependent variables.

Descriptive statistics for PTP scales across the two groups can be seen in Table 19. Wilks' Lambda test of significance revealed the linear combination of the four dependent variables significantly discriminated between the teams with 3 to 15 performance measures and teams with less than 3 or more than 15 measures, $\lambda = 0.89$, $F(4, 127) = 4.00$, $p < .01$ (see Table 20). These results support hypothesis 3.

Table 19.

Means, Standard Deviations, and Valid Teams for the Number of Measures Variable at Each PTP Scale

PTP Scale & Measures Variable	Mean	SD	Valid Number of Teams
Customer Satisfaction			
3 to 15 Measures	5.31	1.60	89
< 3 or >15 Measures	4.80	1.60	43
Psychological Effectiveness			
3 to 15 Measures	4.91	1.50	89
< 3 or > 15 Measures	4.00	1.53	43
Team Effectiveness			
3 to 15 Measures	6.30	1.40	89
< 3 or > 15 Measures	5.40	1.62	43
Resource Utilization & Development			
3 to 15 Measures	5.00	1.60	89
< 3 or > 15 Measures	4.54	1.60	43

Table 20.

MANOVA Test of Significance for Number of Measures and the Linear Combination of the Four PTP Scales

Effect	λ	F	df	η^2
Number of Measures	.89	4.00**	4, 127	.11
Intercept	.06	498.60***	4, 127	.94

*** $p < .001$, ** $p < .01$

Hypothesis 4: Types of Performance Measures and PTP

The fourth hypothesis (H4) predicted that teams with process measures, objective/result measures, financial measures, and customer satisfaction measures would be associated with the highest PTP scale scores. This hypothesis was tested with SPSS canonical correlation analysis in which the first canonical variate was comprised of teams with process measures, objective/result measures, financial measures, and customer satisfaction measures and the second canonical variate comprised the Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development variables.

The first canonical correlation was .29 (see Table 21) indicating that the linear combination of the types of performance measures and PTP scales only shared approximately 9% of the overall variance in the variables. Although the association was in the expected direction, it did not reach statistical significance, $\lambda = .85$, $F(1,6373.40) = 1.30$, $p = .195$. The remaining canonical correlations were also nonsignificant and low in magnitude. These analyses do not support hypothesis 4. Standardized canonical coefficients for Types of Measures and correlations between covariates and canonical variables can be seen in Table 22.

Table 21.

Eigenvalues and Canonical Correlations for Types of Measures and PTP

Root No.	Eigenvalue	Pct.	Cum. Pct.	Canon. Cor.	Sq. Cor.
1	.09	54.92	54.92	.29	.09
2	.06	36.12	91.04	.24	.06
3	.01	8.16	99.20	.12	.01
4	.00	0.80	100.00	.04	.00

Table 22.

Standardized Canonical Coefficients for Types of Measures and Correlations between Types of Measures and Canonical Variables

Variables	Standardized Coefficient	Correlation with Canonical Variables
Types of Measures		
Process Measures	-.64	-.69
Result/Objective Measures	-.35	-.41
Financial Measures	-.19	-.28
Customer Satisfaction Measures	-.52	-.71
PTP Scales		
Customer Satisfaction	-1.34	-.87
Psychological Effectiveness	-.03	-.20
Team Effectiveness	-.05	-.44
Resource Utilization and Development	.72	-.27

Although H4 was not supported there were a few significant bivariate relationships between the types of performance measures and the PTP scale scores that should be noted (see Table 23). There was a significant correlation between the use of Result/Objective Measures and the PTP scale, Customer Satisfaction, $r(131) = .17$, $p < .05$. A significant relationship also existed between the use of Customer Satisfaction

Measures and the PTP Customer Satisfaction scale, $r(131) = .18$, $p < .05$.

Result/Objective Measures was also significantly correlated with Psychological Effectiveness, $r(131) = .17$, $p = .050$. Several other relationships approached significance. Process Measures was correlated with Customer Satisfaction, $r(131) = .16$, $p = .067$. Result/Objective Measures was correlated with Resource Utilization and Development, $r(131) = .17$, $p = .052$.

Table 23.

Pearson Correlations Between Types of Measures and PTP Scales

	Customer Satisfaction	Psychological Effectiveness	Team Effectiveness	Resource Util. & Develop.
Process Measures	.16	.08	.08	.02
Result/Objective Measures	.17*	.17*	.12	.17
Financial Measures	.03	-.12	.02	-.07
Cust. Satisfaction Measures	.18*	-.04	.08	.05

*$p < .05$

Hypothesis 5: Team Participation and PTP

The fifth hypothesis (H5) predicted that teams with the greatest participation in performance management would report higher PTP scale scores. Specifically, it was predicted that greater degree of input into the design of team measurement system would be associated with higher PTP scale scores (H5a). H5b predicted greater involvement in

setting team measures, goals, and objectives would be associated with higher PTP scale scores. H5c predicted greater team involvement in the actual appraisal of team performance would be associated with higher PTP scale scores. These three hypotheses were tested with SPSS canonical and Pearson correlation analyses. The Degree of Team Input in Design, Degree of Input in Setting Measures, Goals, Objectives, and Degree of Input in Team Appraisal served as one canonical variate and Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development served as the other.

The first canonical correlation was .47 indicating that the linear combination of the two sets of variables were highly significantly related, $\lambda = .73$, $F(12,325.72) = 3.50$, $p < .001$; team participation in performance management and PTP scales had approximately 28% of their variance in common. The two remaining canonical correlations were substantially smaller in magnitude implying that the first combination best fit the data (see Table 24). Standardized canonical coefficients for Team Participation and correlations between covariates and canonical variables can be seen in Table 25.

Table 24.

Eigenvalues and Canonical Correlations for Team Participation and PTP

Root No.	Eigenvalue	Pct.	Cum. Pct.	Canon. Cor.	Sq. Cor.
1	.28	77.75	77.75	.47	.22
2	.07	20.01	97.76	.26	.07
3	.01	2.24	100.00	.09	.01

Table 25.

Standardized Canonical Coefficients and Correlations with Canonical Variables

Covariates	Standardized Coefficient		Correlation with Canonical Variables	
	1	2	1	2
Team Participation				
Team Input in Design	-.49	.71	-.82	.42
Team Input in Setting Measures, Goals, Objectives	-.43	-1.04	-.78	-.62
Team Input in Appraisal	-.35	.30	-.76	.17
PTP Scales				
Customer Satisfaction	-.07	.58	-.41	-.27
Psychological Effectiveness	-.34	.97	-.65	.04
Team Effectiveness	-.97	-.50	-.93	-.35
Resource Utilization and Development	.51	-1.40	-.26	-.67

Pearson correlations between the Team Participation variables and the PTP scale scores (see Table 26) indicated significant correlations between Team Input into System Design and both Psychological Effectiveness, $r(131) = .23$, $p < .01$, and Team Effectiveness, $r(131) = .32$, $p < .001$. Relationships between Team Input into System Design and the scales Customer Satisfaction and Resource Utilization and Development were not statistically significant. These correlations partially support H5a.

Significant relationships existed between the variable Team Input into Setting Measures, Goals, and Objectives and all four PTP scales. This dimension was significantly related to Customer Satisfaction, $r(131) = .19$, $p < .05$, Psychological Effectiveness, $r(131) = .22$, $p < .05$, Team Effectiveness, $r(131) = .39$, $p < .001$, and Resource Utilization and Development, $r(131) = .21$, $p < .05$. These relationships support the prediction made in H5b.

The variable Team Input in the Appraisal process was significantly related to Customer Satisfaction, $r(131) = .18$, $p < .05$, Psychological Effectiveness, $r(131) = .28$, $p < .01$, and Team Effectiveness, $r(131) = .33$, $p < .001$. It was not significantly related to Resource Utilization and Development. These correlations partially support H5c. Together, these canonical correlations and Pearson correlations support the prediction made in H5b and partially support the predictions made in H5a and H5c.

Table 26.

Pearson Correlations Between Team Participation and PTP Scales

	Customer Satisfaction	Psychological Effectiveness	Team Effectiveness	Resource Util. & Develop.
Design	.11	.23**	.32***	.01
Setting	.19*	.22*	.39***	.21*
Appraisal	.18*	.28*	.33***	.12

***$p < .001$, **$p < .01$, *$p < .05$

Hypothesis 6: Performance Raters and PTP

The sixth hypothesis (H6) predicted that the greater the number of performance rater levels in the team measurement system, the higher would be the PTP scale scores. These associations were tested with SPSS Pearson correlations that examined the relationships between the number of performance rater levels ($M = 3.21$, $SD = 1.69$) and Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development.

Correlations revealed that the number of performance rater levels was significantly related to each PTP scale. Number of Rater Levels was significantly correlated with Customer Satisfaction, $r(131) = .16$, $p < .05$, Psychological Effectiveness, $r(131) = .27$, $p < .01$, Team Effectiveness, $r(131) = .32$, $p < .001$, and Resource Utilization and Development, $r(131) = .16$, $p < .05$. These analyses support the sixth hypothesis.

Hypothesis 7: Team Measurement Frequency and PTP

The seventh hypothesis (H7) predicted that a greater frequency of team performance measurement would be associated with higher PTP scale scores. These associations were tested with SPSS Pearson correlations looking at the relationship between the frequency of team performance measurement ($M = 4.64$, $SD = 2.41$) and Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development.

Correlation analyses revealed that the frequency of team performance measurement was significantly related to each PTP scale. Frequency of Team

Measurement was significantly correlated with Customer Satisfaction, $r(123) = .18$, $p < .05$, Psychological Effectiveness, $r(123) = .32$, $p < .001$, Team Effectiveness, $r(123) = .33$, $p < .001$, and Resource Utilization and Development, $r(123) = .20$, $p < .05$. These analyses support H7.

Hypothesis 8: Levels of Performance Feedback and PTP

The eighth hypothesis (H8) predicted performance feedback at all four levels would be associated with the highest PTP scale scores. These associations were tested with SPSS point-biserial correlations that examined the relationships between Individual Feedback, Team Feedback, Business Unit Feedback, and Organizational Feedback with Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development.

Correlation analyses revealed that the levels of performance feedback provided did not significantly relate to any of the four PTP scales (see Table 27). However, two sets of relationships were correlated and approached statistical significance. Individual-Level Feedback was positively correlated with Team Effectiveness, $r(131) = .15$, $p = .091$, and Organizational-Level Feedback was negatively correlated with Resource Utilization and Development, $r(131) = -.16$, $p = .068$. These analyses do not support the eighth hypothesis.

Table 27.

Point Biserial Correlations Between Levels of Feedback and PTP

	Customer Satisfaction	Psychological Effectiveness	Team Effectiveness	Resource Util. & Develop.
Individual Feedback	.09	-.03	.15	.05
Team Feedback	.01	.12	.09	-.05
Business Unit Feedback	.04	-.03	.12	-.01
Organizational Feedback	-.13	-.10	-.06	-.16

[a] 0 = Feedback Not Received; 1 = Feedback Received

Hypothesis 9: Frequency of Performance Feedback and PTP

The ninth hypothesis (H9) predicted that greater frequency of team performance feedback would be associated with higher PTP scale scores. These associations were tested with SPSS Pearson correlations that examined the relationship between the frequency of team performance feedback ($M = 4.55$, $SD = 2.50$) and Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, and Resource Utilization and Development.

Correlations revealed that the frequency of team performance feedback was significantly related to each PTP scale. Frequency of Team Performance Feedback was significantly correlated with Customer Satisfaction, $r(123) = .25$, $p < .01$, Psychological Effectiveness, $r(123) = .17$, $p < .05$, Team Effectiveness, $r(123) = .30$, $p < .001$, and

Resource Utilization and Development, $\underline{r}(123) = .22$, $\underline{p} < .01$. These analyses support the prediction made in Hypothesis 9.

Hypothesis 10: Levels of Reward and PTP

The tenth hypothesis (H10) predicted that the utilization of team and business unit rewards would be associated with higher PTP scale scores than those utilizing individual, employee rewards. This hypothesis was tested with SPSS one-way multivariate analysis of variance (MANOVA) using levels of reward as the between-subjects factor and Psychological Effectiveness, Team Effectiveness, Customer Satisfaction, and Resource Utilization and Development as the dependent variables. Table 28 displays the means that were compared in this analysis.

Table 28.

Descriptive Statistics on Dependent Variables across Levels of Reward

Dependent Variable	Individual (n = 84)	Team (n = 38)	Business Unit (n = 5)
Psychological Effectiveness			
Mean	4.48	4.81	5.60
SD	1.54	1.60	0.90
Team Effectiveness			
Mean	6.04	6.00	6.60
SD	1.22	1.94	1.19
Customer Satisfaction			
Mean	5.21	4.80	7.10
SD	1.26	2.00	1.95
Resource Utilization and Development			
Mean	4.94	4.45	6.05
SD	1.43	1.80	1.54

Wilks' Lambda test of significance revealed the linear combination of the four dependent variables significantly discriminated between the Individual, Team, and Business Unit Rewards, $\lambda = 0.85$, $F(8, 242) = 2.54$, $p < .05$ (see Table 29). One-way univariate F-tests (see Table 30) indicated that Customer Satisfaction significantly discriminated between the levels of reward, $F(2, 124) = 5.11$, $p < .01$, $\eta^2 = .08$. Psychological Effectiveness, $F(2, 124) = 1.63$, $p = .199$, $\eta^2 = .03$, Team Effectiveness, $F(2, 124) = 0.46$, $p = .634$, $\eta^2 = .01$, and Resource Utilization and Development, $F(2, 124) = 2.90$, $p = .059$, $\eta^2 = .05$, did not significantly discriminate between levels of reward, although this latter variable did approach statistical significance.

Table 29.

MANOVA Test of Significance for Levels of Reward and the Linear Combination of the Four PTP Scales

Effect	λ	F	df	η^2
Levels of Reward	.85	2.54*	8, 242	.08
Intercept	.14	189.36***	4, 121	.86

*** p < .001, *p < .05

Table 30.

ANOVA Test of Significance for Levels of Reward and the Four Scales of PTP

PTP Variable	df	MS	F	η^2
Customer Satisfaction	2	11.96	5.11**	.08
Psychological Effectiveness	2	3.80	1.63	.03
Team Effectiveness	2	0.99	0.46	.01
Resource Utilization and Development	2	6.98	2.90	.05

** p < .01

Pairwise Comparisons between levels of reward testing Hypothesis 10 can be seen in Table 31. Fisher's Least Significant Difference Test revealed that those utilizing Business Unit Rewards had significantly greater Customer Satisfaction than those utilizing Individual Rewards (Mean Difference = 1.85, p < .05). However, there was no significant difference between Team Rewards and Individual Rewards. These analyses

partially support H10 on the Customer Satisfaction measure. For the measure Psychological Effectiveness, Fisher's Least Significant Difference Test revealed no significant differences between Business Unit Rewards or Team Rewards and Individual Rewards. These analyses do not support H10 on Psychological Effectiveness. On the Team Effectiveness measure, tests of significance also revealed no differences between the levels of reward. These analyses do not support H10 on the Team Effectiveness measure. Fisher's Test also revealed no significant differences between levels of reward on the Resource Utilization and Development measure. These analyses do not support H10 on Resource Utilization and Development. However, significant differences were observed between those utilizing Business Unit Rewards and Team Rewards on two of the PTP scales. Those utilizing Business Unit Rewards were significantly higher on Customer Satisfaction than those using Team Rewards (Mean Difference = 2.29, $\underline{p} < .01$). Those utilizing Business Unit Rewards were also significantly higher than those using Team Rewards on Resource Utilization and Development (Mean Difference = 1.60, $\underline{p} < .05$).

Table 31.

Pairwise Comparisons between Levels of Reward for Each Scale of the PTP

PTP Variable	Reward	Reward	Mean Difference	Std. Error
Customer Satisfaction				
	B. Unit	Team	2.26**	.73
	B. Unit	Individual	1.85*	.70
	Team	Individual	-0.44	.30
Psychological Effectiveness				
	B. Unit	Team	0.76	.73
	B. Unit	Individual	1.10	.70
	Team	Individual	0.33	.30
Team Effectiveness				
	B. Unit	Team	0.65	.70
	B. Unit	Individual	0.52	.68
	Team	Individual	-0.14	.29
Resource Utilization and Development				
	B. Unit	Team	1.60*	.74
	B. Unit	Individual	1.11	.72
	Team	Individual	-0.49	.30

**p < . 01, *p < .05

Hypothesis 11: Types of Rewards and PTP

The eleventh hypothesis (H11) predicted that the utilization of both financial and non-financial types of rewards would be associated with higher PTP scale scores than those utilizing either financial or non-financial rewards alone. This hypothesis was tested with SPSS one-way multivariate analysis of variance (MANOVA) using types of reward as the between-subjects factor and Psychological Effectiveness, Team Effectiveness,

Customer Satisfaction, and Resource Utilization and Development as the dependent variables. Wilks' Lambda test of significance revealed the linear combination of the four dependent variables did not significantly discriminate between Financial, Non-Financial, or Both Financial and Non-Financial Rewards, $\lambda = 0.94$, $\underline{F}(8, 248) = 0.97$, $\underline{p} = .457$, $\eta^2 = .03$.

Pairwise Comparisons between levels of reward testing Hypothesis 11 can be seen in Table 32. Fisher's Least Significant Difference Tests revealed that no significant differences existed between Financial Rewards, Non-Financial Rewards, or the combination of Both Financial and Non-Financial Rewards for any of the four PTP scales. These analyses revealed that Hypothesis 10 was not supported for Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, or Resource Utilization and Development.

Table 32.

Pairwise Comparisons between Types of Reward for Each Scale of the PTP

PTP Variable	Reward	Reward	Mean Difference	Std. Error
Customer Satisfaction				
	Both Types	NonFinancial	-4.87	.34
	Both Types	Financial	-0.29	.34
Psychological Effectiveness				
	Both Types	NonFinancial	0.27	.33
	Both Types	Financial	0.11	.33
Team Effectiveness				
	Both Types	NonFinancial	3.54	.31
	Both Types	Financial	-0.48	.31
Resource Utilization and Development				
	Both Types	NonFinancial	-0.19	.34
	Both Types	Financial	-0.31	.34

Supplementary Analyses

A supplementary analysis was performed on the variable Type of Team in order to discover statistical differences in PTP scores between Project Teams (n = 43, 32.82%) and Permanent Teams (n = 88, 67.18%). SPSS independent samples t tests revealed no significant differences between Project/Temporary Teams and Permanent/Stable Teams on Customer Satisfaction, Psychological Effectiveness, Team Effectiveness, or Resource Utilization and Development (see Table 33).

Table 33.

Means and Standard Deviations for Type of Team at Each PTP Scale

PTP Variable	Type of Team	Mean	SD	Std. Error of Mean	t(129)
Customer Satisfaction					
	Project	75.23	19.25	.29	-.42
	Permanent	77.73	14.69	.16	
Psychological Effectiveness					
	Project	68.32	18.30	.26	.35
	Permanent	67.93	17.82	.16	
Team Effectiveness					
	Project	74.73	19.83	.27	-1.27
	Permanent	79.30	12.98	.14	
Resource Utilization and Development					
	Project	67.10	18.24	.26	-.59
	Permanent	69.53	16.63	.16	

A supplementary analysis was performed on Team Size in order to observe relationships between group size and each of the four scales of the PTP. Pearson correlation analyses revealed that the size of the team was not significantly correlated with Customer Satisfaction, $r(131) = .02$, ns, Psychological Effectiveness, $r(131) = .02$, ns, Team Effectiveness, $r(131) = .00$, ns, or Resource Utilization and Development, $r(131) = .09$, ns.

A supplementary analysis was also performed on Level of Interdependence with the four scales of the PTP. SPSS multivariate analysis of variance (MANOVA) using

Working Groups, Pseudo Teams, Potential Teams, and High Performance or Self-Managed Teams as the between-subjects levels and the PTP scales as the dependent variables. The frequency statistics for the variable can be seen in Table 34. The sample consisted of eight Working Groups, 11 Pseudo Teams, 36 Potential Teams, 50 Real Teams, and 10 High Performance or Self-Managed Teams. Seventeen responses (13%) were missing.

Table 34.

Frequency Distribution for Level of Interdependence

Variable & Value Label	Frequency	Percent	Valid %	Cumulative %
Working Group	8	6.10	6.96	6.96
Pseudo Teams	11	8.33	9.57	16.52
Potential Team	36	27.27	31.30	47.01
Real Team	50	37.88	43.48	89.74
Self-Managed Team	10	7.58	8.70	100.0
Missing	17	12.88	-	
Total	132	100.0	100.0	

Wilks' Lambda test of significance revealed the linear combination of the four dependent variables significantly discriminated between the five levels of team interdependence, $\lambda = 0.59$, $F(16, 327.53) = 3.86$, $p < .001$ (see Table 35). Customer Satisfaction, $F(4, 110) = 5.14$, $p < .01$, $\eta^2 = .16$, Psychological Effectiveness, $F(4, 110) = 19.73$, $p < .001$, $\eta^2 = .27$, Team Effectiveness, $F(4, 110) = 20.24$, $p < .001$, $\eta^2 = .34$, and Resource Utilization and Development, $F(4, 110) = 7.26$, $p < .001$, $\eta^2 = .21$, significantly

discriminated between the levels of interdependence. These univariate analyses can be seen in Table 36 and the table of means is presented in Table 37.

Table 35.

MANOVA Test of Significance for Level of Interdependence and the Linear Combination of the Four PTP Scales

Effect	λ	F	df	η^2
Level of Interdependence	.59	3.86***	16, 327.53	.12
Intercept	.06	432.24***	4, 107	.94

*** p < .001

Table 36.

ANOVA Test of Significance for Level of Interdependence and the Four Scales of PTP

PTP Variable	df	MS	F	η^2
Customer Satisfaction	4	11.11	5.14**	.16
Psychological Effectiveness	4	19.73	10.31***	.27
Team Effectiveness	4	20.24	13.86***	.34
Resource Utilization and Development	4	15.29	7.40***	.21

***p < .001, **p < .01

Table 37.

Descriptive Statistics on Dependent Variables across Levels of Interdependence

Dependent Variable	Working (n = 8)	Pseudo (n = 11)	Potential (n = 36)	Real (n = 50)	Self-Managed (n = 10)
Psychological Effectiveness					
Mean	4.43	2.42	4.50	5.13	5.71
SD	1.10	1.60	1.14	1.47	1.71
Team Effectiveness					
Mean	5.90	4.26	5.52	6.74	7.16
SD	1.10	1.43	1.27	1.21	0.61
Customer Satisfaction					
Mean	5.28	3.64	4.67	5.60	5.54
SD	1.05	1.60	1.80	1.26	1.19
Resource Utilization and Development					
Mean	4.73	2.95	4.60	5.33	5.72
SD	1.26	1.14	1.47	1.48	1.65

Pairwise Comparisons between Levels of Interdependence can be seen in Table 38. Fisher's Least Significant Difference Test revealed that Working Groups had significantly greater PTP scale scores than Pseudo Teams. The mean difference was 1.65 ($p < .05$) on Customer Satisfaction and 2.01 ($p < .01$) on Psychological Effectiveness. Fisher's Least Significant Difference Test revealed a mean difference of 1.62 ($p < .01$) on Team Effectiveness and 1.78 ($p < .01$) on Resource Utilization and Development.

Potential Teams had significantly greater PTP scale scores than Pseudo Teams.

On the Customer Satisfaction measure the mean difference was 1.03 ($p < .05$). The mean difference was 2.04 ($p < .001$) on Psychological Effectiveness and 1.26 ($p < .01$) on Team Effectiveness. Potential teams were also significantly more effective than Pseudo Teams on Resource Utilization and Development (mean difference = 1.65, $p < .01$).

Fisher's Least Significant Difference test revealed that Real Teams were more effective than both Pseudo Teams and Potential Teams. On the Customer Satisfaction measure Real Teams had a mean difference of 1.95 ($p < .001$) with Pseudo Teams and 0.92 ($p < .01$) with Potential Teams. On Psychological Effectiveness the mean difference with Pseudo Teams was 2.71 ($p < .001$) and 0.66 ($p < .05$) with Potential Teams. On the Team Effectiveness measure Real Teams had a mean difference with Pseudo Teams of 2.47 ($p < .001$) and 1.21 ($p < .001$) with Potential Teams. On Resource Utilization and Development the mean difference was 2.38 ($p < .001$) with Pseudo Teams and 0.73 ($p < .05$) with Potential Teams.

Pairwise comparisons also revealed statistical mean differences between Self-Managed Teams and Working Groups, Pseudo Teams, and Potential Teams. On Customer Satisfaction Self-Managed Teams were more effective than Pseudo Teams (mean difference = 1.90, $p < .01$). On Psychological Effectiveness Self-Managed Teams were more effective than Pseudo Teams (mean difference = 3.29, $p < .001$) and more effective than Potential Teams (mean difference = 1.25, $p < .05$). The mean difference with Working Groups was 1.28 ($p < .05$), 2.90 ($p < .001$) with Pseudo Teams, and 1.64 ($p < .001$) with Potential Teams on the Team Effectiveness measure. On Resource Utilization and Development Self-Managed Teams were more effective than Pseudo

Teams (mean difference = 2.78, $\underline{p} < .001$) and more effective than Potential Teams (mean difference = 1.12, $\underline{p} < .05$).

Table 38.

Pairwise Comparisons between Levels of Interdependence for Each Scale of the PTP

PTP Variable	Team	Team	Mean Difference	Std. Error
Customer Satisfaction	Self-Managed	Potential	0.87	.51
	Self-Managed	Pseudo	1.90**	.64
	Self-Managed	Working	0.26	.70
	Real	Potential	0.92**	.32
	Real	Pseudo	1.95***	.49
	Real	Working	0.31	.56
	Potential	Pseudo	1.03*	.51
	Working	Pseudo	1.64*	.68
Psychological Effectiveness	Self-Managed	Potential	1.25*	.49
	Self-Managed	Pseudo	3.29***	.60
	Self-Managed	Working	1.28	.66
	Real	Potential	0.66*	.30
	Real	Pseudo	2.71***	.46
	Real	Working	0.70	.53
	Potential	Pseudo	2.04***	.48
	Working	Pseudo	2.01**	.64
Team Effectiveness	Self-Managed	Potential	1.64***	.43
	Self-Managed	Pseudo	2.90***	.53
	Self-Managed	Working	1.28*	.57
	Real	Potential	1.21***	.26
	Real	Pseudo	2.47***	.40
	Real	Working	0.86	.46
	Potential	Pseudo	1.26**	.42
	Working	Pseudo	1.62**	.56
Resource Utilization and Development	Self-Managed	Potential	1.12*	.52
	Self-Managed	Pseudo	2.77***	.63
	Self-Managed	Working	0.99	.69
	Real	Potential	0.73*	.32
	Real	Pseudo	2.38***	.48
	Real	Working	0.60	.55
	Potential	Pseudo	1.65**	.50
	Working	Pseudo	1.78**	.67

*** $p < .001$, ** $p < .01$, * $p < .05$

CHAPTER V

DISCUSSION

Summary and Integration of Results

Team Development and Team Performance

In this investigation it was expected that developmentally mature teams would have higher customer satisfaction, psychological and team effectiveness, and resource utilization than less mature teams. Specifically, it was anticipated that teams in the Performing stage would evidence greater performance than teams in the Forming, Storming, or Norming stages. This prediction was supported, but only in part. Teams in the Performing stage demonstrated greater customer satisfaction, psychological and team effectiveness, and resource utilization than teams in both the Storming and Norming stages. However, there were no performance differences found between the teams in the Performing and Forming stages. The study also expected to find that teams in the Norming stage of development would evidence greater performance than teams in the Forming and Storming stages; however, little support for this position was found. The only performance difference observed was on psychological effectiveness in which those teams in the Norming stage demonstrated greater psychological effectiveness than teams in the Storming stage.

Levels of Measurement and Team Performance

This study also expected to find greater performance by those team leaders reporting performance measurement at the individual, team, business unit, and organizational levels. This prediction was partially supported. The data from this study indicated that customer satisfaction performance was predicted by measurement at the individual and business unit levels, but not at the team or organizational levels. Team and psychological effectiveness performance was greater only with measurement at the business unit level; measurement at the individual, team, or organizational levels had no bearing on perceived team and psychological effectiveness. The utilization of resources was not predicted by performance measurement at any level implying that the use of resources was relatively independent of what level it was measured.

Number of Measures and Team Performance

The study also predicted performance differences based on the number of performance measures used by teams. It was expected that teams with 3 to 15 performance measures would evidence greater performance than teams with less than 3 or more than 15 measures. This prediction was partly supported in that the combination of all performance indices discriminated between these two sets of teams. However, the two groups did not differ on all performance measures. Although both psychological and team effectiveness was greater for those teams with 3 to 15 performance measures, there were no differences between the groups on customer satisfaction and resource utilization.

Types of Measures and Team Performance

Additionally, this study hypothesized that the types of performance measures utilized by teams would predict team performance. More specifically, it was expected that utilization of process measures, result/objective measures, financial measures, and customer satisfaction measures would predict performance. However, this assumption was not supported by the study. In fact, there was little in common between types of measures used and performance. Only three significant relationships between specific measures and performance were found. The use of result/objective measures and customer satisfaction measures were both positively related to customer satisfaction and the use of result/objective measures was positively associated with psychological effectiveness.

Team Participation and Team Performance

The study further proposed that greater degree of team involvement in the performance management process would be evidenced by greater performance. At a general level, this hypothesis was supported in that team participation in performance management shared a great deal in common with performance indices. More specifically, however, it was also expected that involvement in the design of the team performance measurement system would be linked with increased performance. This prediction was only partially supported. Team participation in system design was associated with greater psychological and team effectiveness; however, it was not related to customer satisfaction or resource utilization. It was also predicted that team involvement in setting team measures, goals, and objectives would be associated with increased performance. This premise was fully supported in that the level of involvement

in setting team measures, goals, and objectives was related to increased customer satisfaction, psychological and team effectiveness, and resource utilization. The prediction was also made that team involvement in the actual appraisal of team performance would be linked to increased performance. This assumption was not fully supported. Level of team involvement in team appraisal was associated with increased customer satisfaction and both psychological and team effectiveness but was not related to resource utilization.

Number of Rater Levels and Team Performance

This study also hypothesized that teams with the greatest number of performance rater levels would evidence greater performance. This expectation was supported in that the number of performance rater levels was positively related with greater customer satisfaction, psychological and team effectiveness, and resource utilization.

Measurement Frequency and Team Performance

The prediction that frequency of team performance measurement would be associated with performance was supported. The increased frequency of team performance measurement was meaningfully connected to increased customer satisfaction, psychological and team effectiveness, and resource utilization.

Levels of Feedback and Team Performance

These studies further anticipated that individual, team, business unit, and organizational performance feedback would all be linked with performance. However, this was not supported. In fact, there were no significant relationships between any feedback level and performance. Nonetheless, two relationships approached statistical

significance. Individual performance feedback was positively related to team effectiveness and organizational performance feedback was negatively related to resource utilization. However, both associations were relatively small in magnitude and therefore questionable in importance.

Feedback Frequency and Team Performance

The expectation was that frequency of team performance feedback would be meaningfully related to performance. This expectation was supported. It was observed that frequency of team performance feedback was associated with customer satisfaction, psychological and team effectiveness, and resource utilization.

Levels of Reward and Team Performance

It was further anticipated that those teams with team and business unit level rewards would both exhibit greater performance than those with individual level rewards. This premise was only partially supported. Teams with business unit level rewards had greater customer satisfaction than those with individual level rewards but no other performance differences were found between these groups. However, findings did indicate that those utilizing business unit level rewards had greater customer satisfaction and resource utilization than those using primarily team level rewards.

Types of Rewards and Team Performance

It was also hypothesized that those teams receiving both financial and non-financial rewards would possess greater performance than teams receiving only one form of reward. However, this prediction was not supported in that there were no performance

differences found between those with the combination of financial and non-financial rewards, financial rewards alone, or non-financial rewards alone.

Additional Findings

Other findings in this study were noteworthy. In this investigation, performance was not related to the size of a team or to the specific type of team in that project/temporary teams and stable/permanent teams had similar levels of performance. A supplementary look at levels of team interdependence and performance indicated that the five levels of interdependence discriminated performance in that Working Groups, Potential Teams, Real Teams, and Self-Managed Teams had greater customer satisfaction, psychological and team effectiveness, and resource utilization than Pseudo Teams. In addition, Real Teams had greater customer satisfaction, psychological and team effectiveness, and resource utilization than Potential Teams. Self-Managed Teams also had greater psychological and team effectiveness and resource utilization than Potential Teams; however, they did not have greater customer satisfaction. Self-Managed Teams evidenced greater team effectiveness than Working Groups. No differences in performance were observed between Self-Managed Teams and Real Teams.

Explanation of Findings

Team Development and Team Performance

As expected, mature teams generally outperformed less mature teams. The highest level of team development, labeled Performing, is a stage in which the group passes through earlier stages and comes to a full understanding of its tasks and purpose,

and performs as a team. Here, the team members seek continued growth and learning. By the time this level of maturity is reached, the team has united, worked through individual and team conflicts, understood their roles, trust one another, and have learned to work together. In this study, teams in the Performing stage evidenced greater performance than teams in Storming and Norming stages. The Storming stage, characterized by frustration, confusion, uncertainty, and a lack of trust, represent teams that are unable to tap the power of its collective effort or unite around the goals and tasks of the team. The Norming phase represents a level of maturity one stage higher than Storming but one stage lower than Performing. These team members have begun to trust one another, work through their differences, and are learning to work together. However, their level of maturity prevents them from obtaining the performance results achieved by those teams who have reached the Performing stage of development. These findings were expected based on literature that suggests team development or maturity is an important component or predictor of team performance. Maturity of teams is a key prognosticator for performance outcomes. With maturity comes increased performance, as evidenced by Performing teams in this study.

However, no meaningful differences between Performing and Forming teams was discovered. Forming characterizes newly formed teams where norms have yet to be established and where the group is not yet united or cohesive. This lack of performance discrepancy is likely the result of a very small pool of teams in the Forming stage in that only two team leaders out of 132 classified their teams as Forming. There were a total of 13 teams in the Storming stage, 50 teams in the Norming stage, and 62 teams in the

Performing stage of development. Because of the extremely small sample of Forming teams, it is not possible to make accurate or meaningful performance distinctions between the Forming and Performing teams. It is likely that these two respondents either failed to answer the Stage of Development item accurately or misunderstood the item. However, it should be noted that Performing teams clearly outperformed Storming and Norming teams. Therefore, it could be anticipated that with an adequate number of Forming teams in this study the entire prediction would have been supported.

Although Performing teams were observed to have the greatest performance, Norming teams, in general, did not outperform less mature teams. There were no notable performance differences between Norming teams and Storming teams on customer satisfaction, team effectiveness, or resource utilization. This finding may indicate that the variations in maturity or development between the Norming and Storming stages are smaller than expected or less important for performance purposes than literature predicts. However, it was observed that Norming teams had greater psychological effectiveness than Storming teams. Storming is characterized as a stage of psychological frustration, antagonism, confusion, and uncertainty experienced by the team. It seems both reasonable and expected that Norming teams, where these differences have been resolved and roles are understood, would have greater psychological effectiveness. It seems the developmental differences between Norming and Storming was rather unimportant for customer satisfaction, team effectiveness, or resource utilization. Nevertheless, findings suggest that Norming teams had greater team effectiveness and resource utilization but the differences were much smaller. If true differences in performance exist between

teams in Norming and Storming, they are probably small or subtle. Due to the small and inadequate number of Forming teams, however, it is not possible to make true distinctions between these teams and Norming teams in this study. As stated previously, the two Forming respondents either failed to answer the item accurately or misunderstood the item.

Levels of Measurement and Team Performance

It was revealed that individual, team, business unit, and organizational measurement were not able to completely predict performance. However, the most important level of performance measurement occurred at the business unit level. Performance measurement at this level predicted customer satisfaction, and psychological and team effectiveness. Business unit performance measurement did not predict resource utilization. The second most important level of performance measurement occurred at the individual, employee level. This level of performance measurement predicted customer satisfaction and team effectiveness. It did not predict psychological effectiveness or resource utilization. Unexpectedly, neither team level nor organizational level performance measurement predicted performance. The inability of team level performance measurement to predict performance was surprising given the literature reviewed that attests to its importance for team performance. This raises the question whether team performance measurement is irrelevant for team performance or done so poorly in R&D organizations that it fails to contribute to performance. However, a small, positive connection was found between team level performance measurement and team

effectiveness which may indicate that team measurement is of some small importance and not entirely irrelevant.

This pattern of measurement results seems to suggest that in R&D team settings, the performance measurement of an entire business unit is most important followed next by individual performance measurement. Often times, and especially in R&D, multiple teams comprise a business unit and they work together on product development or design. R&D teams usually work alongside and collaborate with other teams to complete a project or develop an entire product. Teams may be assigned separate pieces of the overall design or product so that the business unit is then responsible for the whole project. It seems as if R&D teams perform the best when the business unit as a whole is evaluated rather than their specific team; thus, this way they receive performance information on the entire project. This implication is supported by a highly significant, positive relationship between business unit measurement and team effectiveness. Business unit measurement was found to have the strongest relationship with team effectiveness. However, an alternative explanation might be that team performance measurement is done so poorly in these organizations that it fails to impact performance, as literature would indicate.

Individual performance measurement predicted both customer satisfaction and team effectiveness. Although teams are responsible for the work, it seems that individual contributions are deemed useful to R&D team performance outcomes. Individual, employee performance measurement was valuable in R&D environments in spite of the fact that teams and most likely the business unit are responsible for a projects, products,

or designs. This finding provides ongoing support for the continued use of individual performance measurement in a team environment. Individual team members need to know how they are performing and contributing to the group and larger project. None of the performance measurement levels predicted resource utilization, but a significant relationship was observed between this and individual performance measurement. This suggests utilization of resources and development is relatively independent of performance measurement. However, the small association between resource utilization and individual performance measurement may indicate that this aspect of performance is under the control of each individual employee rather than the team, business unit, or organization. Despite the fact that all four, performance measurement levels did not predict performance as expected, there was some evidence of their importance. Meaningful relationships existed between each of the measurement levels and team effectiveness suggesting that appraisal at each possible level provides some assistance to a team in reaching greater performance.

Number of Measures and Team Performance

The number of performance measures utilized by teams was of value in determining performance outcomes between teams. Teams with 3 to 15 measures evidenced greater performance than teams with less than 3 or more than 15 measures. This finding was completely expected because teams with too few performance measures do not have enough data to determine how they are performing while teams with too many measures get bogged down in measurement bureaucracy and typically ignore measures they see as unimportant. Specifically, it was observed that psychological and

team effectiveness was greater for the teams in the 3 to 15 measures group compared to the teams in the less than 3 or more than 15 measures group.

This pattern of results is consistent with previous literature on the appropriate number of measures. A closer inspection of means between the two groups revealed that the 3 to 15 group had a greater number of measures than the less than 3 or more than 15 group. The means of the 3 to 15 group hovered just above five measures while the measures mean of the less than 3 or more than 15 group was less than five. This implies that the less than 3 or more than 15 group did not have enough measures to obtain quality performance information for continuous improvement. The 3 to 15 measures group utilized three to seven quality measures in their performance measurement system. It is important to have a few vital measures that encompass the important aspects of work. Too many measures distract a team from its work because they spend most their time focused on appraisal rather than performance while too few measures are just as troublesome because teams do not get the information they need. In this study the under-performing teams generally had too few measures or not enough performance-related data to adequately encompass the important aspects of their work.

Types of Measures and Team Performance

This study found that specific types of performance measures were not able to predict performance. Process measures, result/objective measures, financial measures, and customer satisfaction measures had a small, weak relationship with performance. This outcome was surprising given the literature emphasizing the need for balanced measures that address process skills, objective results, financial indices, and customer

satisfaction. It seems a balance or diversity of performance measures is less important for R&D teams than stated in the literature. Although these four types of measures did not together predict performance as expected, a few noteworthy relationships were observed. Result/objective measures were related to customer satisfaction and psychological effectiveness. In addition, customer satisfaction measures were related to customer satisfaction.

Clearly, the utilization of result/objective performance measures could be defended as important to team performance in R&D settings based on these findings. R&D teams are largely responsible for well-defined projects working on products or designs. There was no significant evidence to substantiate the importance of process or intangible team measures, such as communication, collaboration, problem solving, or cohesion. The lack of findings for process or intangible measures could be related to the type of work or operation styles of the team members who participate in R&D. Typically, these individuals, such as scientists and engineers, are accustomed to working alone under highly complex and analytical circumstances. R&D professionals are often the types who resist working in teams altogether and prefer to work alone on projects. Many hold on to the belief that working alone is more constructive and productive than working as part of a team. For these reasons, R&D environments have been one of the last areas to shift towards team-related work. It is possible that the R&D team leaders in this study are less likely to see the value of team process measures because of their focus on objective data, results, and project outcomes. Those in complex work environments

more often concentrate on individualistic contributions to the outcome of a team project rather than viewing it as a shared, collaborative effort.

Team Participation and Team Performance

There was evidence to support the prediction that team involvement in the performance management process leads to greater performance. Team participation in the design of the performance management system, involvement in setting team measures, goals, and objectives, and participation in the appraisal itself shared a great deal in common with performance. Team participation in system design was highly connected to both psychological and team effectiveness. This finding was anticipated due to literature that suggests teams are more effective when they become involved in the design of their own performance measurement system. There is a sense of ownership gained through participation in system design that produces motivation to perform well within that system. However, no relationships were found between system design and customer satisfaction and resource utilization. This was not too surprising, as customer satisfaction and resource utilization appear to tap external team processes or circumstances not totally under the control of the team. The sense of ownership gained from involvement in system design would likely impact internal team processes such as psychological and team effectiveness.

It was found that team participation in setting measures, goals, and objectives was meaningfully related to performance. This finding was expected as literature testifies that the process of setting measures, goals, and objectives is a critical aspect of team involvement that leads to greater performance. This involvement represents the key

ingredient in creating team ownership or buy-in. With ownership or buy-in, the team is likely to show increased responsibility and accountability for its work. A team is more responsible and motivated to achieve greater customer satisfaction, psychological and team effectiveness and resource utilization when it has greater authority to map out its own course. This implication was clearly supported.

Team participation in the appraisal process was significantly linked with customer satisfaction and psychological and team effectiveness. It was not related to resource utilization. This particular finding also lends support for the value of team ownership or performance management buy-in. Literature maintains that teams perform better when they are involved in the performance management process. This way performance management is viewed as a process for continuous improvement rather than as a means of punishment or control by supervisors or top management. When teams are active performance raters they are able to see first-hand how well they are doing. This involvement creates motivation, accountability, and increased responsibility due to their active role in performance measurement. It was not surprising that team participation in appraisal was not related to resource utilization. Resource utilization reflects a team's ability to effectively manage its resources so is not a measure of effectiveness or team performance viewed as under a team's total control. This overall pattern of team participation results implies that team members know what they need to perform effectively. Their involvement ensures that these needs are met by the performance management system.

Number of Rater Levels and Team Performance

This study demonstrated that the number of performance rater levels in the team measurement systems was significantly and positively related with performance. This was anticipated as literature on team performance management suggests that multi-rater performance measurement offers the most valuable assessments of team-related work. Those who have a stake in team performance should evaluate the work. A more complete or comprehensive picture of team performance is achieved when other teams, internal and external customers, team members, supervisors, team leaders, and other stakeholders are involved in team performance appraisal. Through multi-rater performance measurement teams receive valuable information from varied sources that spurs continuous improvement, which accounts for the meaningful links with customer satisfaction, psychological and team effectiveness and resource utilization. Single-rater measurement or simply appraisal by supervisors or management cannot capture all of the important aspects of team performance. Performance measurement is most effective when it occurs at all the various levels at which the team operates.

Measurement Frequency and Team Performance

Frequency of team performance measurement was substantially connected with customer satisfaction, psychological and team effectiveness, and resource utilization. This particular finding was predicted because literature implies greater frequency of team performance measurement leads to improved performance. This occurs because a team is receiving increased attention and continuous performance information. The increased frequency of team measurement allows a team to stay on track and make adjustments in

performance quickly. Infrequent performance appraisals often solidify poor work habits because months or even a year may pass before a team is made aware of its performance results. Frequent performance measurement is a key aspect of continuous team improvement whereas annual or semi-annual performance appraisal is often viewed as a mechanism of organizational control; a process dreaded by the employees, which fails to impact performance. Adjustments or changes in performance for continuous team improvement are not feasible with annual or semi-annual performance measurement.

Levels of Feedback and Team Performance

Surprisingly, the level at which performance feedback was provided to teams was not connected to performance. This outcome was unexpected because team performance management literature attests to the importance of feedback at multiple levels, especially at individual and team levels. Two feedback levels were moderately related to performance but not significant or meaningful. This lack of findings could imply that though feedback itself is important, the specific levels at which this is provided are trivial for R&D teams. These findings could also indicate problems with the survey instrument such as a failure to tap this relationship adequately due to confusion on the part of the team leaders or a poorly worded question. The survey may have been hindered by the inbility to properly assess the relationship between levels of feedback and performance.

Frequency of Feedback and Team Performance

Just as frequency of team performance measurement was meaningfully related to performance, so was the frequency of team performance feedback. This finding suggests that increased frequency of team performance feedback was related to customer

satisfaction, psychological and team effectiveness, and resource utilization. Feedback has been universally linked to performance improvements throughout psychological literature. Frequent team feedback allows a team to make ongoing, continuous improvements in the work they do. This way, team performance is more likely to stay on track so that poor work habits do not sabotage the work. This finding clearly suggests that frequent feedback is connected to the process of continuous R&D team improvement. Less frequent team performance feedback at annual or semi-annual reviews provides little in the way of information or data that can be used for continuous problem solving or learning. Often, the team's project deadlines have long since passed or the project has been completed leading to missed improvement opportunities.

Levels of Reward and Team Performance

A few performance differences were found between levels of reward. However, it should be noted that distinct performance differences between teams grouped by individual, team, or business unit rewards were few. Those with business unit rewards had greater customer satisfaction than those utilizing individual rewards. However, there were no other performance differences found between those utilizing business unit rewards and those using individual rewards. In addition, no performance differences were observed for those grouped by team rewards and those grouped by individual rewards. These results were unexpected because business unit rewards and team rewards are intended to align team members with one another, build team unity, and promote collaboration on performance tasks. Individual rewards in team-based settings have been known to inadvertently communicate to team members that what is most important to the

organization is individual behavior rather than the work performed by the team or business unit. It has been believed that with individual-based reward systems team members are less motivated to come together as a team to achieve results because it reinforces the tendency to work toward individual accomplishments. For the most part, this literature was not supported. It appears that team performance outcomes are largely unrelated to the specific levels of rewards provided to employees in R&D. However, problems with the survey instrument or confusion about specific survey items could account for this negative finding.

Subsequently, it was found that customer satisfaction and resource utilization was greater for those receiving primarily business unit rewards compared to those receiving primarily team rewards. This particular finding and the failure to find performance discrepancies between team rewards and individual rewards suggest different implications from those previously cited in literature. History dictates those R&D specialists such as scientists and engineers have typically worked alone. However, in recent years R&D professionals have come together in teams to design or produce certain aspects of a whole project or design. Often, the business unit, comprised of several teams, is responsible for the entire project. Therefore, rewarding the entire business group for the success of the project appeared to be relevant for greater customer satisfaction and utilization of resources. Individuals in R&D may view their team as a less important piece of their performance-related outcomes. Individual team members in R&D often prefer to work in isolation and may only come together in teams when it is time to piece their work together and contribute to the business unit. These work styles

dictated by personality or the nature of the work itself may account for this finding. This may also point out that R&D teams function differently and go about the work they do in ways that are strikingly dissimilar from other types of traditional work teams.

Types of Rewards and Team Performance

No support was found for performance differences based on the types of rewards received by teams. It appeared that whether the teams received primarily financial, non-financial, or a combination of financial and non-financial rewards was largely irrelevant. It was expected that a balance between financial rewards such as merit increases, bonuses, and stock options with non-financial alternatives such as public recognition, parties, prizes, and gift certificates would yield greater performance. It appears this performance management process was more trivial than anticipated. It seems the specific types of rewards provided were immaterial to actual performance differences between teams. Although unrelated to performance, rewards could be of consequence to issues not addressed in this study such as individual and team morale, turnover, attitude, and absenteeism. However, it should be pointed out that difficulties with the survey instrument could also account for the lack of findings. It is possible that the two survey items regarding rewards failed to adequately tap the relationships between rewards and performance, or that team leaders were confused by these items.

Additional Findings and Team Performance

Two important demographics failed to relate to performance. There were no performance differences found between project/temporary teams and permanent/stable teams working in R&D. It seems that whether a team is assembled only for the duration

of a project then disbanded is no more or no less effective when compared to permanent, stable teams who engage in long-term, day-to-day work together.

Surprisingly, there was also a failure to find a relationship between the size of teams and performance. This was remarkable given the literature that attests to its importance. Most authors suggest teams with 8 to 10 members are optimal because large groups have difficulty coming together to achieve performance goals because social loafing increases. Large groups are easily distracted from the tasks at hand and have difficulty uniting and achieving a common sense of purpose. However, in R&D teams, size appears less important. The overwhelming majority of team literature has been conducted in manufacturing environments so less is known or has been written about team size in knowledge work environments or R&D settings. Team size may be immaterial to R&D where the work is unique for each team. A large team of 20 scientists and engineers may be just as likely to achieve performance goals as a team of four to five individuals. This lack of findings may also lend additional support for the idea that R&D teams function quite differently than traditional work teams. The team as a vehicle for performance may be of less importance than the individual contributions that make up a team or business unit.

A supplementary look at levels of team interdependence revealed remarkable differences on performance. Self-Managed Teams represent the highest level of team performance according to the literature because they use their team as a vehicle for performance achievement and are characterized by a great deal of commitment for one another and their tasks. As expected, they outperformed every type of team except Real

Teams. Self-Managed Teams completely outperformed Pseudo Teams and had greater team effectiveness than Working Groups. Pseudo Teams represent groups of individuals with team-related tasks to accomplish but who are unable to collectively work together, unify, or commit to a common purpose for doing their work. These teams are notorious for poor performance and usually under perform even individuals working alone. In addition to Self-Managed Teams, Real Teams, Potential Teams, and Working Groups evidenced greater performance than Pseudo Teams. This pattern supports what the literature states about Pseudo Teams in that they typically underachieve or sabotage work. Real Teams, also known for high performance, outperformed Potential Teams as expected. The failure to find performance variation between Real Teams and Self-Managed Teams is not surprising because their differences are subtle. The qualitative difference is the care and concern about the growth and development of others on a Self-Managed Team. This characteristic is not a defining quality of Real Teams. For the most part, these findings with R&D teams support the idea that greater performance outcomes are achieved by Real Teams and Self-Managed Teams. Even Work Groups who have no real reason to perform as a team are more effective than Pseudo Teams. Pseudo Teams have group performance needs that are unmet and work becomes sabotaged by the team's inability to unite, collaborate, or arrive at a common goal.

Integration of Findings with Past Literature

Convergent Findings

Bruce Tuckman (1965, 1977) analyzed over 70 studies of group development to conceptually differentiate developmental differences between groups. The present

study's findings support the definitions, analyses, and implications espoused by Tuckman's stages of group development. Performance outcomes were differentiated by stage of development in R&D teams. This conclusion was similar to findings revealed in a study of 86 knowledge work teams (Roberts, 1998). In that particular study, stage of team development significantly predicted perceived team effectiveness. Performing teams were more effective than Forming and Storming teams and Norming Teams were more effective than Forming teams. Similarly, in the current study of R&D teams, Performing teams evidenced greater performance than Storming and Norming teams. The current study also revealed that Norming teams had greater psychological effectiveness than Storming teams. Once teams progress through Forming and Storming stages resistance has been conquered which allows them to attain Norming then Performing stages where performance outcomes are greatest. A small sample of respondents in the Forming and Storming stages may have prevented further performance distinctions from being noticed. For the most part, these results replicate the conclusions made in a previous study of knowledge teams and generalize the importance of team development processes to R&D teams. Organizations, management, and individual team leaders ought to recognize the development needs of their teams and assist in creating a culture or process whereby teams can grow and develop. Mature teams outperform newer or less developed teams so attention to these processes is crucial.

An important area of convergence with previous literature dealt with the number of performance measures utilized by R&D teams. It was observed that teams with a total of 3 to 15 measures had significantly greater performance. Specifically, greater

psychological and team effectiveness was observed for these teams when compared to teams with less than 3 or more than 15 total measures. Based on an inspection of means teams with greater performance evidenced a higher number of total performance measures in their performance measurement systems. The ideal number of measures appeared to range from three to seven based on means across performance indices. This finding supports previous literature that emphasizes the importance of avoiding both over documentation and inadequate documentation (Mohrman & Mohrman, 1994). It has been recommended that teams limit the number of measures they want to use and avoid measurement bureaucracy by including only the major points needed to reach performance goals (Jones & Moffett, 1999; Meyer, 1994). Meyer (1994) and Schilling (1997) specifically state that a team measurement system should not include less than three or more than 15 measures. Jones and Moffett (1999) suggest teams should only utilize four to eight measures if it receives monthly feedback. In order to capture the complexity of R&D work, it seems reasonable that teams in this environment might require more measures than in more traditional business settings. However, Brown and Svenson (1988) disagree and suggest R&D measurement systems should be kept simple with no more than six to eight key indices. The current findings support these ideas of avoiding over documentation and inadequate documentation with R&D teams. That is, keeping the measurement system simple with enough measures to capture important performance data but not too many whereby the team is smothered. It seems with three to seven measures performance goals and organizational strategy is secured. A

complicated system is typically ignored but a simple system allows teams to easily track and record how they are doing and make adjustments in performance.

This study found that objective/result-oriented measures for R&D teams predicted both customer satisfaction and psychological effectiveness. Customer satisfaction measures predicted customer satisfaction. Process measures and financial measures were not connected to performance. This finding resembles what has been stated in previous R&D literature about the overwhelming preference for a goal or a management by objectives approach (MBO) to performance measurement (Meinhart & Pederson, 1989). In addition, Brown and Svenson (1988) state that the most effective systems for measuring R&D performance should include measures of outcomes and outputs, not behaviors. In fact, these authors suggest that only those accomplishments for which a value can be established should be used as measures. The objective results or outcomes of projects, products developed, or designs provide the greatest amount of information for R&D teams to excel while process/intangible and financial measures do little to impact team performance.

A key area of convergence with previous literature was the impact of team participation in performance management. The findings support previous literature that attests to and describes the importance and relevance of team participation in performance management. It was found that team participation indices were meaningfully connected to performance. Team participation in the design of the performance measurement system was significantly related to both psychological and team effectiveness. Team participation in setting measures, goals, and objectives was

connected to customer satisfaction, psychological and team effectiveness, and resource utilization. Team participation in the appraisal process itself was related to customer satisfaction and both psychological and team effectiveness. Experts such as Jones and Moffett (1999) frequently cite the importance of "buy-in" as a mechanism for creating effective performance measurement systems for teams. This is the ownership that occurs when teams participate in the performance management process. They indicate that when team members take dominion over their measures their performance on them is magnified. Team participation in performance management also allows them to resolve difficulties. Though Jones and Moffett admit that the ideal amount of team participation is unknown, it is nonetheless critical. They suggest that teams need not participate in every decision about system development but a healthy dose of participation ensures team ownership. The relationship between performance and team participation in system design discussed by Jones and Moffett (1999) was supported in this study of R&D teams.

The most critical area of team participation, noted in literature, is the process of setting team goals, measures, and objectives. This maxim was overwhelming supported in this study of R&D teams. This aspect of team participation was meaningfully affiliated with performance. In fact, it was the only team participation element significantly associated with all performance indices. This finding replicates and extends research conclusions by Mohrman et al. (1992) who suggest that a positive relationship exists between teams defining their own performance standards and team effectiveness. Mohrman and Mohrman (1994) have stated that teams must be active participants in performance measurement and goal definition to produce maximum effectiveness. They

suggest internal team planning and the setting of goals should be largely team defined. Their research has demonstrated that those teams who define performance themselves achieve more than those whose managers or supervisors define performance for them. The findings of this study clearly support this principle and extend it to teams in R&D settings.

The practice allowing teams to be involved in the appraisal of their performance extends to R&D teams. The team itself is a key stakeholder of performance and its involvement in the appraisal process promotes responsibility and accountability for the work performed. In addition to the benefits of ownership that occurs when teams are involved, team members also feel empowered. Appraisal participation enhances a team's ability to communicate openly and effectively with one another (Levy & Steelman, 1996). Multi-rater (i.e., 360 Degree) appraisal has been cited as the most effective means for evaluating team work (Mohrman & Mohrman, 1994; Shaw & Schneir, 1995). The team itself has been considered one of these key raters. Team participation in appraisal was meaningfully related to customer satisfaction and both psychological and team effectiveness. These findings imply that the popular multi-rater approach to team performance measurement should also include the R&D team itself.

Literature has overwhelming supported the concept of multiple raters as the best means for assessing performance, especially with teams (Mohrman & Mohrman, 1994; Carrell, Elbert, & Hatfield, 1995; Shaw & Schneir, 1995; Levy & Steelman, 1996). This idea was extended to R&D teams based upon current findings that revealed the number of performance rater levels was significantly related to customer satisfaction, psychological

and team effectiveness, and resource utilization. The multiple rater approach to team measurement was developed in order to create an effective means for providing the most valuable and accurate data for teams (May, 1996). Managers and supervisors are often in a relatively poor position to do this and their measurements are often misleading or inaccurate. Those who have a stake in the team's performance should evaluate its work (Mohrman & Mohrman, 1994). Therefore, the greater the number of performance raters the more likely the teams receive the quality performance information they need to continuously improve and excel. Raters include the individual team members, the team itself, other collaborative teams, team leaders, internal and external customers, and supervisors or managers. The relationship between the number of rater levels and performance legitimizes the idea that multiple rater performance measurement should be extended to R&D teams. Teams receive more accurate and important performance data to ensure they stay on track when multiple raters are utilized to evaluate their work.

Team performance management literature asserts that teams are more effective when they are evaluated frequently and consistently. In fact, when the shift to teams is made it means that old, traditional annual or semi-annual reviews should be discarded (Harrington-Mackin, 1994; Hitchcock & Willard, 1995; Lawler, 1994; Mohrman, 1990). Teams need to know how they are doing frequently so they can make necessary adjustments in performance. Frequent performance measurement is a natural aspect of flatter, team-based work designs. In their study of successful teams, Shaw and Schneir (1995) revealed that these teams are evaluated more frequently, consistently, and thoroughly. In the current study of R&D teams, this idea was completely supported as

evidenced by the relationship with performance. Frequency of team performance appraisal was meaningfully connected to customer satisfaction, psychological and team effectiveness, and resource utilization. This finding extends literature in this area to R&D teams because like other teams, continuous improvement is achieved via frequent performance measurement because it prevents poor work habits from developing and keeps teams constantly on track toward performance goals. Irregular appraisals or performance measurement that occurs once or twice per year is less productive for R&D teams. These antiquated types of performance appraisals are often viewed as a nuisance to teams or as a means of punishment or control by management because they do little if any to impact performance.

The benefit of performance feedback has become an undisputed principle in the field of psychology. The advantages of feedback for performance improvement across a variety of settings have been well documented (Pritchard, et al., 1988). In the present investigation of R&D teams it was revealed that frequency of team performance feedback was significantly linked to customer satisfaction, psychological and team effectiveness, and resource utilization. Thus, the most effective R&D teams were provided with more frequent feedback, which corroborates what literature has previously stated about successful teams. A flourishing teamwork perspective involves the persistent process of performance monitoring and feedback (Levy & Steelman, 1996). Just like performance measurement, teams need regular or continuous feedback that is not possible in traditional measurement systems. In fact, these findings together support previous literature that implies measurement and feedback processes should be carefully linked or

joined to maximize their effectiveness (Hitchcock & Willard, 1995; Jones & Moffett, 1999). These findings also imply that irregular performance feedback or the utilization of annual and semi-annual feedback was probably trivial. The importance of frequent measurement and feedback can now be generalized to R&D team performance settings.

Supplementary results revealed that performance was discriminated between the five levels of interdependence. Working Groups involve individuals who get together to share information, best practices, and ideas to help each individual perform his or her job most effectively. They function without a common purpose or goals. Pseudo Teams view themselves as teams but lack a common purpose and goals. They typically underachieve and perform well below expectations for teams. Potential Teams possess important performance goals and work together to achieve those goals. However, they lack clarity regarding their purpose, goals, and products. They need assistance to create mutual accountability. Real Teams are defined as a small number of individuals with complementary skills who are committed to a common goal, purpose, and approach to their work. Self-Managed or High-Performance Teams have no immediate supervisor. They are completely interdependent, share mutual responsibility, and have the highest performance potential. They represent the highest level of interdependence and encompass the qualities inherent in Real Teams in addition to a commitment to each other's growth and development (Katzenbach & Smith, 1993a).

In this study of R&D teams, Self-Managed and Real Teams generally had greater performance while Pseudo Teams under-performed all other teams. It was commonly observed that with increasing levels of interdependence performance results improved.

However, no significant performance differences between Self-Managed Teams and Real Teams were observed. These findings, as literature suggests, state that with increasing interdependence performance outcomes improve (Katzenbach & Smith, 1993a). Thus, team-based organizations should pay special attention to these processes in order to promote interdependence and this now extends to R&D organizations with teams. Teams perform most effectively when they are allowed the necessary interdependence to function autonomously. When teams determine, manage, and hold themselves responsible for goals or objectives performance is magnified (Katzenbach & Smith, 1993b).

Relationships between levels of team interdependence and performance support ideas discussed in team literature and match previous sample distributions and performance results found for stages of team development. Level of team interdependence and stage of team development or maturity share some commonalities. Pseudo Teams appear to have a great deal in common with the Storming stage of development. Both Pseudo Teams and Storming teams comprised 10% of the sample and are notorious for underachievement. All other teams outperformed them. Potential Teams (31% of sample) appear to have much in common with Norming teams (38% of sample). These teams are developing norms and understanding their roles while on their way to becoming Real Teams or Performing teams. They perform better than Pseudo Teams and Storming teams but less than Real Teams and Performing teams. Real Teams comprise 43% of the sample and share important characteristics with Performing teams (47% of sample). Their performance outcomes were generally greater than all other

teams besides the Self-Managed or High-Performance Teams. Self-Managed Teams have similar characteristics and performance outcomes as Real Teams.

Divergent Findings

A striking divergence from previous literature was the failure to find that team-level performance measurement predicted performance in R&D teams. Previous literature from various authors and researchers has suggested that the addition of team performance measurement to individual performance measurement represents the cornerstone of effective team-based performance measurement systems (Harrington-Mackin, 1994; Hitchcock & Willard, 1995; Levy & Steelman, 1996; Meyer, 1994; Mohrman, 1990; Mohrman et al., 1992; Mohrman & Mohrman, 1994; Roberts, 1998; Shaw & Schneir, 1995; Zigon, 1997). However, in this investigation of R&D teams performance was most impacted by business unit performance measurement followed by individual performance measurement. Business unit and individual performance measurement significantly predicted customer satisfaction and team effectiveness. The utilization of business unit measurement alone also predicted psychological effectiveness. Team-level performance measurement did not predict performance. The only relationship observed for team-level performance measurement was a small association with team effectiveness.

These findings imply that with R&D teams the most significant performance measurement levels occur at the business unit and individual levels rather than team level. R&D teams often function merely as smaller systems of an entire business unit. The business unit as a whole may be responsible for an entire project, product, or design.

Each team within the business unit may be assigned a certain piece of the greater project. Therefore, the business unit seems to play the major role in effective performance measurement for R&D teams. Evaluating the outcome or result of the entire project, product, or design appears most appropriate in these settings. Several teams often work together as a business unit to create a new product or service. These teams work with and interact with other teams and usually do not function independently of one another. It seems that individual, employee performance measurement continues to be important as has been demonstrated in other team-based settings because scientists, researchers, and engineers need to know how they are doing as team members. Individual performance measurement ensures that team members are aware of their own specific behaviors and how they contribute to the product or service created by the business unit. This way, both star performers and poor performers can be identified. The cultural norms of the United States, and much of western society, dictate that individual performance should be identified, evaluated, rewarded, and recognized. This belief or attitude continues to prevail in the majority of R&D organizations and impacts performance.

Another remarkable divergence with previous team performance management literature was the failure to find relationships between process/intangible measures and performance in R&D teams. Several authors and researchers have emphasized that well-done performance measurement ought to have a balance between output or result measures and input or process measures. They boldly state that these process or input measures are just as important as measures of results or outcomes (Harrington-Mackin, 1994; Levy & Steelman, 1996; Meyer, 1994). Experts also include measures of customer

satisfaction and financial measures, such as revenues, gross margins, costs, capital assets, and debt systems, as important to well-done performance measurement (Meyer, 1994). In the present study of R&D teams, only measures of result/outcomes and customer satisfaction were connected to performance.

Surprisingly, a relationship between process measures and performance was not encountered. It has been believed that teams require both objective, result-oriented measures and process measures such as participation, communication, collaborative decision-making, conflict resolution, problem-solving, trust, adaptability, interpersonal relations, and team spirit or morale (Baker & Salas, 1996; Harrington-Mackin, 1994). These findings imply that the nature of teamwork in R&D settings is different from teams in manufacturing or less complex knowledge work. Here the emphasis is on creating new products, services, and designs where the focus is on objective results or outcomes. In addition, the personalities and work styles of scientists, researchers, and engineers are often individually focused and result-oriented rather than team or process-oriented. This implication is related to the failure to find a connection between team-level measurement and performance. Business unit and individual employee measurement was found to be most important. Team processes or team-level measurement seem to be immaterial for R&D teams that focus on objective results, outcomes, and products produced by the business unit. Furthermore, R&D teams are often designed as a Work Group or merely a collection of individuals assigned one piece of an overall project. Management provides the "team" label when in reality it may not fit. Therefore, intangible team processes may

be viewed as less relevant or secondary to the results or outcomes produced by so-called R&D teams.

The current study also diverged with previous literature in that neither individual nor team performance feedback was related to performance. There was no evidence for the importance of specific levels of performance feedback for R&D teams despite previous research that has concluded that group or team-level feedback is important (Barr & Conlon, 1994; Pritchard et al., 1988; Roberts, 1998). It has also been suggested that the most advantageous performance management systems allow for constant feedback at both individual and team levels (Mohrman & Mohrman, 1990). This study of R&D teams failed to replicate or extend the meaningful connection between individual level or team level feedback and performance for R&D teams. This finding implies that the specific level of feedback provided to teams might be unimportant in R&D settings so long as some type of frequent performance feedback is granted. As stated previously, R&D teams may function as merely a collection of individuals so that specific feedback at a team or individual level is unnecessary. However, this discovery might also indicate inadequacies in the survey instrument or the failure of team leaders to adequately assess this performance management process.

There was also a general failure to find meaningful performance differences based on rewards utilized. There were few notable relationships between specific levels of reward (i.e., individual, team, and business unit) or types of rewards (i.e., financial, non-financial, and combination of financial and non-financial) and performance. This was somewhat of an unexpected divergence from team performance management literature.

Research has demonstrated that the more employees were rewarded for team performance, the better the team and business unit performed (Mohrman & Mohrman, 1990). These authors suggest that basing rewards on team performance help achieve the necessary alignment in the performance management of teams. However, others have suggested that the productivity bounce from team rewards is actually quite small after the impact from well-done performance definition, measurement, and feedback is taken into account (Pritchard, et al., 1988). This study's results either support the literature written by Pritchard or simply suggest that rewards for R&D teams are less important for actual performance than previously believed.

The scarcity of performance differences based on rewards utilized may lend support to the ideas of some that rewards are either meaningless or punishing. Kohn (1993) and Hitchcock and Willard (1995) suggest rewards punish, fracture relationships, and ignore behavior at the root of either excellent or poor performance. They believe that rewards impede intrinsic motivation to excel. These authors conclude that rewards are irrelevant to performance because the often-used reward practices in many of today's organizations ignore the complexity of humans who interact interdependently in intricate organizations. However, the failure to find notable performance differences could also indicate that the survey instrument failed to adequately assess this complicated relationship. Rewards likely assist in the alignment of team processes and promote a team-friendly culture within an organization. Team rewards may also be related to a sense of equity, fair compensation, and general satisfaction that was not tapped by survey items in this particular study.

A supplementary look at team size and performance diverged from implications cited in literature. There was no relationship between the size of R&D teams and performance. This was somewhat unexpected as past literature implies that this is an important aspect of team performance. It has been discussed that increases in team size beyond a certain point can impede team performance (Morgan & Lassiter, 1992) as social loafing increases. Large numbers of people have difficulty interacting effectively as a group and easily become distracted. Katzenbach and Smith (1993b) suggest that the majority of effective teams have had 10 or fewer members. However, they state that this is more of a practical guide than an absolute requirement. They witnessed effective teams ranging from 2 to 25 persons.

It seems that team size is probably less important in R&D settings. This implication is tied to previously cited conclusions that suggest R&D teams most likely function and operate differently than interdependent teams seen in manufacturing or other knowledge work settings. Team size may be irrelevant in R&D teams because they function primarily as Work Groups and do not collaborate or share a common purpose. The term "team" may be a label given to them from management. Rather than functioning as a legitimate team, they work together only to accomplish a certain piece of an overall, business unit project. Team size appears more critical to Real Teams or Self-Managed Teams where performance is dependent upon the collaborative efforts and mutual purpose shared by the members. Socially desirable or biased responding may account for the large numbers of team leaders that classified their teams as Real or Self-

Managed in this particular study. R&D human resource practitioners suggest that the overwhelming majority of teams in these settings are no more than Working Groups.

Contributions of Findings to Literature

Even after more than 50 years of research on teams in the workplace, surprisingly little empirical work has been done on the performance management process of knowledge teams. The majority of team performance management literature that has been written is based on teams in manufacturing environments where the work is typically easier to manage, quantify, and evaluate. Much less is known or been written about teams in knowledge work settings. Greater ambiguity and uncertainty exists in these work environments, while projects are unique and continually evolving. Authors and human resource practitioners have attempted to generalize existing team performance management information to knowledge work settings in recent years but actual empirical research is scarce. In recent years there has been a shift toward team-based designs in the most complex areas of knowledge work, identified as research and development. Despite this shift, organizations have virtually no team performance management literature to assist them in the management of their teams so the need for empirical literature is paramount. There continues to be reliance upon the "art" of team performance management rather than "science." The current study contributes significantly to the current body of team performance management literature because it extends, generalizes, and elaborates practices to teams concentrated in R&D settings where performance is more difficult to measure. A growing body of empirical literature is needed for team-based performance management in knowledge work settings because current practices

and information are flawed, untested, or based primarily on anecdotal research conducted in manufacturing settings. This investigation is the first to empirically describe and clarify team performance management processes that impact R&D team performance.

The results of the present study contribute to team performance management knowledge by extending some aspects of previous literature to R&D teams while adding new distinctions. Team development processes and team interdependence were important elements linked to performance. R&D organizations, like other organizations, need to serve and cultivate the developmental needs of their teams by creating a culture where teams can mature and function interdependently. The most important levels of R&D performance measurement occur at the business unit and individual, team member level. The need for actual team-level performance measurement seems less important in R&D settings because several teams often work together or collaborate on a business unit project or product. Business unit measurement was highly related to team effectiveness so teams still appear to receive the important information they need to excel. Rather than functioning as real teams, R&D teams might actually be better described as Working Groups that get together to work on a larger project. A measurement system with three to seven performance measures focused on objective results, outcomes, and customer satisfaction seems ideal. As with other types of teams, a simple system encompassing all relevant performance needs that is easily understood and utilized appears most effective in R&D. However, the performance of R&D teams does not appear to be related to the utilization of process measures as it is with other types of traditional work teams. Intangible team processes are less important if teams function primarily as Working

Groups. R&D team performance is also impacted by team involvement in the performance management process, most notably the process of setting performance measures, goals, and objectives. Multiple raters, frequent performance appraisals, and frequent performance feedback were important to R&D team performance as has been cited with other types of teams in literature. However, feedback at predefined or specific levels seems less important than the fact that feedback in some form is provided frequently. Some minor evidence was found that business unit rewards are linked to increased performance. However, for the most part, performance differences based on rewards were negligible. Rewards could be important if they contribute to a sense of equity, general team morale, or overall satisfaction.

Implications of Findings

Theoretical Implications

Team performance management is an area where practice has greatly outstripped theory. This has been troubling because team performance management represents the key element in the overall human resource management of an organization. Performance appraisal is at the core of these management processes. Despite its importance, the field has been significantly handicapped by a lack of theory development. This has been identified as one of the major factors contributing to the difficulties inherent in team performance management. There has been little theoretical progress to guide these initiatives. Thus, team performance management has been labeled as "art" rather than "science" because of the scarcity of theory development and empirical study (Jones, 1997).

Organizational Effectiveness theory represents the closest framework for guiding team performance management processes (Jones, 1997). Based upon the needs of the particular organization, team performance management can be focused toward the Goal Model, which focuses on results or outputs, the Natural Systems Model, which concentrates on processes, the Multiple Constituents Model, which emphasizes customer satisfaction and ratings from key stakeholders of performance, or a blend of these models. The general emphasis in traditional manufacturing and knowledge work teams has been a blend of the Goal Model and Natural Systems Model for the origination and implementation of team performance management systems.

The results of this study suggest that the Goal Model blended with the Multiple Constituents Model is the most valuable theory for R&D team performance management processes. The emphasis on intangible team processes does not impact performance for R&D teams, as they appear to do for other types of teams in both manufacturing and knowledge work settings. Jones (1997) recommends that the type of performance measures needed should guide the theory utilized. In this study of R&D teams, results and objective outcomes were associated with some performance-related outcomes but process-oriented measures were not. There was also some evidence that customer satisfaction measures were important in addition to a significant relationship found between multiple performance raters and performance. This would suggest a blend of the Goal Model and Multiple Constituents Model could guide the performance management process for R&D teams. This places the emphasis on results and outcomes blended with ratings from key constituents.

Research Implications

Empirically, little is known about team performance management practices or how successful teams manage performance. Even after years of research on teams in the workplace there are few principles or specifications available for guiding team performance management. The literature largely lacks scientific rigor, which is understandable given that practitioners and consultants mostly write it. This has been an area where practice has always led research. What has been empirically studied has focused on teams in manufacturing environments. There is a scarcity of research on knowledge work teams where greater ambiguity and uncertainty exists in the work. Even less is known about teams in R&D settings where the most complex levels of knowledge work occur. Most of the R&D performance management research has focused on individuals. Empirical investigations of R&D team performance management processes have been absent until now.

This study represents one of the first steps to establish a body of literature for R&D team performance management. The few articles that have been published in this area present general findings about the importance of R&D team performance management according to the opinions of managers or supervisors. Most of the research in knowledge work settings has focused on general issues in team performance management. Little in the way of actual empirical investigations of team performance management practices has occurred. There is a significant need for investigating performance management practices at the team level where the real work transpires.

Often, the team performance management practices revealed by managers and supervisors are different from those actually occurring down at the team level.

This study has addressed a glaring need regarding the study of team performance management practices and team performance in R&D settings. Empirically justified guidelines and practices are needed so that this human resource initiative can achieve its purpose for promoting continuous team improvement. The research implications of this study on team performance management are unique. The systematic study of these processes has yet to occur in R&D environments so it is believed that this study will serve as a stepping-stone for additional research in this setting. Not all work teams are alike. The differences in work teams based upon the level of interdependence, work performed, and organizational setting should be accounted for when team performance management systems are designed and implemented. With the expected utilization of work teams in R&D settings to continue to rise, the time has come to establish a scientific body of information for human resource practitioners to draw upon to support these teams. This study is a first step in establishing this body of literature.

Applied Implications

Trends suggest that the American work force is shifting toward greater utilization of work teams. Similarly, the number of work teams in R&D environments has risen dramatically in recent years and continued growth is expected. Despite their ever-increasing popularity, many organizations continue to struggle with how to adequately measure and manage R&D team performance because of the unique, non-routine nature of the work. A shift to a team-based organizational design has the potential to

dramatically increase organizational effectiveness while at the same time allowing the organization to meet the challenges of a competitive global marketplace. However, this love affair that corporate America is having with teams has blinded many from making important changes in training, design, or support systems. The most important support system is the process of managing team performance. Various team experts have suggested that when teams disappoint or fail it can often be traced to an inadequate or antiquated system for measuring and managing team performance. When the switch to teams is made, many organizations continue to rely upon old, traditional, hierarchical processes for managing performance. What is needed is a redesign of this support system toward a more lateral, flatter process where the team, business unit, and their various constituents evaluate the work performed. The naïveté with which organizations attempt to manage team performance has been astounding. It is believed that this current study of team performance management practices will assist R&D organizations in their attempts to design and implement this important human resource initiative.

The findings of this study offer specific applied suggestions for team performance management in R&D organizations. Despite the complexity of the work the system for managing team performance should remain simple. Creating a complex system to encompass the complex nature of the work seems justified. However, this reasoning is flawed. Instead, it is advised that an ideal system for R&D teams should possess three to seven measures on important performance variables. This way, teams are able to focus on key performance indices rather than getting smothered in measurement bureaucracy. Teams typically ignore all but the most relevant performance measures. It is highly

recommended that teams participate in the design, process, and appraisal of performance measurement. It appears that through team participation ownership or buy-in is cultivated whereby teams become more motivated and responsible for achieving performance objectives. The most important aspect of team involvement appears to be the process of setting measures, goals, and objectives. It seems that performance measurement at the business unit level and individual, team member level is most significant especially if the team functions primarily as a Working Group. Several teams often work together on a single project. Therefore, performance measurement at a team level seems largely unnecessary when the entire business unit project is appraised in addition to individual team member contributions to the greater project. R&D teams also appear to perform more effectively the more frequent their performance is appraised and the more frequent they receive feedback. Frequent measurement and feedback seem to promote continuous improvement on projects that may have extended cycle times before completion. This allows performance to stay on track when a particular R&D project spans months or even years.

Limitations

Despite the importance and usefulness of this investigation's findings, there are some inherent limitations that should be taken into account when interpreting the findings. Some of these weaknesses were identified in previous explanations but will be discussed here. The most significant limitation is the study's non-experimental design. Because of this, it is not possible to imply causation or suggest that certain performance management practices cause either low or high performance in R&D teams. However, in

interpreting the correlations that were found it is important to consider that even though correlation does not connote causation, causation does necessitate correlation. That is, though the present study cannot make causal interpretations, in the instances in which correlations were present, there is the possibility that causation exists. Yet, this type of design prohibits making definitive proclamations about the effects of the performance management practices on measures of customer satisfaction, psychological and team effectiveness, and resource utilization. In a non-experimental investigation one must consider alternative explanations for the results found in addition to those predicted. The lack of experimental control opens the door for potential confounding variables to influence the results.

The most significant potential confounds that limit this investigation of R&D team performance management practices result from issues related to the reliability, validity, and scope of the measures. Self-report surveys are based upon subjective opinions so they often lack unbiased consistency and accuracy. This element opens up the possibility for alternative explanations other than ones hypothesized or expected. Confounds are likely when there is a reliance on self-report as an indicator of observable behavior rather than direct observations or objective performance data. Reactivity to the measurement procedures is also a possibility resulting in less-than-perfectly reliable responses, missing data, and possible biases. Survey respondents were aware that a composite profile of their organization's team practices and effectiveness would be reported back to their organizational liaison. Therefore, reactivity and a response set, potentially due to socially desirable responding, may have influenced team leader

responses. The potential for team leaders to bias the survey data is problematic. Their perceptions of team performance may be skewed when compared to those of the team itself, various team stakeholders, and management. The most accurate perceptions of team performance would come from the team itself, the team leader, and the multiple constituents that surround the team.

Additionally, the Perception of Team Performance measure is a new instrument with limited information concerning its utility. Although the author of the instrument concluded that it possessed adequate reliability for basic research, the four principle factors were skewed and validity analyses have not been performed. The PTP instrument has been modified and adapted since its original development. Therefore, the present study was only the second empirical investigation utilizing the current version of the measure. There does not exist a body of literature on the PTP from which to make critical judgments about the reliability, validity, and generalizations of this instrument across different settings with diverse work teams. Despite the limited research on the PTP, this measure provides the most comprehensive, in-depth information available from which to evaluate the quality of team performance. Self-report instruments like this are limited but the trade-off is attractive. The PTP is user friendly and allows the researcher to collect large amounts of data on in-depth areas of team performance.

The study may also be limited by statistical analyses utilized to answer the questions. Correlational statistics were employed to test several of the hypotheses. These types of analyses are hindered by their inability to make unidirectional links between one variable and another and by their limitation to assessing linear associations.

Correlation coefficients describe only the magnitude of the relationship between variables. Their utility is limited to describing data rather than making true inferences about the relationships. Therefore, alternative explanations may account for the significant relationships between team performance management practices and performance other than those concluded by the researcher. With a sample of 132 participants, coefficients as small as .16 are considered statistically significant at a 2-tailed alpha of .05. These relationships, although statistically significant, offer little in the way of practical significance given their small size. Inferential analyses were utilized to test other predictions so explanations for these results are easier to support than correlational analyses. The statistical limitations are related to the study's correlational design. However, at the expense of making causal attributions or causal connections between team performance management practices and performance, this study gained natural-environment or external validity because of the procedures and methods used for collecting and analyzing data.

Issues pertaining generalizability of the sample are also important to consider when interpreting the present findings. As mentioned earlier, the Forming teams examined in this study contained only two cases. This sample size is too small to even consider extrapolating the findings from. Conclusions pertaining to this group will remain tentative until these findings are replicated with a larger sample size. Furthermore, the nature of data collection presents some limitations. Although Internet surveys are becoming increasingly common, this method of data collection is fraught with difficulties. The most important issue pertaining to the use of this methodology is

that of a self-selection bias. There is no way to know how individuals who chose to participate differ from those who did not. It is possible that the results from this study will only generalize to individuals who volunteer for the study. A second issue related to this methodology pertains to the lack of control over who completed the survey. Although there were no controls over this issue, it is doubtful that individuals other than those who qualified and were genuinely interested participated in the study. It should also be noted that using only team leaders could be considered a limitation. They represent only one perspective and are not entirely a homogenous group. It was discovered that some team leaders served multiple functions other than the team lead. Some had supervisory or management responsibilities while others did not. This could have lead to possible response biases.

Future Directions

This study represents an important first step in performance management for knowledge work teams in research and development settings. Very little empirical work has been published about team performance management processes and even less is known about teams in knowledge work settings. The lack of available literature and subsequent research in this area can be tied to the difficulties inherent in measuring the performance of teams in these settings. R&D work has long been recognized as difficult to evaluate because of its complexity, creativity, uncertainty, uniqueness, and extended cycle times. In fact, it has only been in the past 12 years that performance management in R&D has come to be accepted and valued. Before this, performance management was viewed as a deterrent to performance because it was believed to stifle creativity. R&D

organizations believed it was not possible to capture the intricacies of this work through performance management processes. However, as global competition and the demands for high-quality work has heightened, R&D organizations have come to accept and realize the importance of performance management. The problem is that no information or literature has been previously available to R&D organizations utilizing teams. Team performance management has been a notoriously difficult human resource initiative and few are content with their current practices. Therefore, a growing body of R&D team performance management literature is needed. It is hoped that this study represents that first step.

Continued investigation of team performance management in R&D settings is needed. Given that so little work has been done in this area, one of the first focal points for future research should be on replicating the findings from the present study and further analyzing team and business unit performance management. Future studies replicating this current investigation should expand data collection to include not only team leaders but also team members. This would increase the reliability and accuracy of the information collected and provides greater credibility. Performance management practice information could also be collected from supervisors and management so that discrepancies and commonalties could be assessed. Future studies in this area should also consider collecting performance-related information from multiple constituents. The current study used performance perceptions from team leaders. Just as it has been demonstrated that team performance measurement data increases in usefulness when rated by multiple stakeholders, the accuracy and utility of this study's dependent measure

would increase if team members, designated customers, other teams, supervisors, and managers were able to rate team performance in future studies. Another direction for future research would involve case studies. With broad surveys it is difficult to assess R&D team performance management with a great deal of depth. Case studies allow for the in-depth analysis of one or two organizations that utilize team-based performance management. This permits the intricacies of team performance management to be addressed and analyzed. This kind of information is difficult to address in survey-based research. In a new field of study large, broad-based empirical studies are of value for generalization and description while in-depth case studies explore the utility of specific techniques and practices.

Knowledge work organizations have a shortage of performance management research information to support their teams. This study addressed the needs of the highest level of knowledge work, identified as Knowledge Creation Systems, where performance measurement is most difficult. This is a level that requires technical and service providers from similar or different fields to cooperate, share, and manipulate ideas for solving problems, creating a new product or service. Additional studies addressing other levels of knowledge work are imperative. Separate and unique empirical team performance literature is needed for Information Processing levels of work where teams process large amounts of data, rely strongly on computerization, and typically do not perform cognitively complex work. Research on Technical and Service Provider teams, such as attorneys, financial advisors, customer service representatives, and consultants would be beneficial because of their unique one-on-one encounters with

clients or customers. Team performance management research might also be extended to Service Delivery teams where the customer is directly involved in the work process through contact with multiple service providers. These teams are often found in hospitals, sales groups, and universities. The broad area of knowledge work encompasses a heterogeneous blend of work teams so a body of literature at each level would greatly benefit the field of team performance management. This research offers an important first step in building a base of team literature for performance management in research and development settings.

APPENDIX A

R&D TEAM PERFORMANCE MANAGEMENT SURVEY

R&D Team Performance Management Survey

This survey is intended for teams involved in research and development or design. Typically, this level requires technical and service providers from similar or different fields to cooperate, share, and manipulate ideas for solving problems, creating a new product or service. Examples often include teams of engineers and/or scientists.

Directions: *If the above description accurately depicts the type of work performed by your team please complete the questions below. Answer the questions on this survey for the primary team with which you are associated.*

1. What is your job title?

_____

2. What is your role on this team?

_____

3. Circle the type of industry with which your team is involved?

Communications	Financial	Oil & Gas
Computing Technology	Government	Consulting
Pharmaceuticals/Healthcare	Aerospace	Chemical
Environmental	Automobile	Academic
Foods	Machinery	Electronics

Other: *(Please list)*_____

4. How many employees are there at your location or site?

_____

5. How many of these employees are involved in R&D?

_____

6. How many employees are on this team?

_____

7. What type of R&D work does this team perform? Check all that apply.

_____ Basic research *(Research directed at understanding a subject area, unrelated to any particular future application.)*

_____ Applied research *(Gaining knowledge needed to reduce basic research findings to general areas of practice.)*

_____ Development *(Using the results of applied research in the design of new or improved products or manufacturing processes.)*

8. Which type most accurately describes this team?

_____ Project Team *(This team is assembled only for the duration of a project. Once the project is complete, the team disbands.)*

_____ Permanent Team *(This team is a stable group. They engage in day to day work together to complete projects or tasks.)*

9. Is this a distributed, dispersed, or "virtual" team *(Does this team communicate and interact more via email, Internet, or telephone than through face-to-face contact.)*

_____ YES

_____ NO

10. How long has this team been together?

_____ Months

11. Check the one stage of team development that most closely describes this team's usual level of functioning *(Tuckman, 1965; Tuckman & Jensen, 1977).*

_____ Forming: *(The group is newly formed, roles have not yet been established, and the group is not yet united.)*

_____ Storming: *(The group is frustrated, angry, confused, or uncertain over some discrepancy between individual hopes for the group & reality.)*

_____ Norming: *(The members understand their roles, have established shared norms, are beginning to value diversity, & are learning to work together & trust each other.)*

_____ Performing: *(The group understands the tasks and purpose, & performs as a team. The members yearn for continued growth & learning.)*

_____ Adjourning: *(The group is separating and going their different ways. The group is in the process of termination.)*

_____ Reforming: *(The group is transitioning out of adjourning and back to Forming as it launches a new project.)*

12. How long has your site or location utilized team-based or project performance measurement?

_____ Years _____ Months

13. At what levels is performance actually measured? Check all that apply.

_____ Individual employee

_____ Team or Project

_____ Business Unit

_____ Organization

14. Rate the complexity of the performance measurement system used with this team?

0	1	2	3	4
simple				very complex

15. What types of performance measures are used with the team or project? Check all that apply.

_____ Process measures *(Examples: communication, collaboration, conflict-resolution, interdependence, team unity, teamwork, participation, innovation, learning, etc.)*

_____ Result/Output/Outcome measures *(Examples: team goal achievement, systematic project progress, projects completed, deadlines met, publications, new products or designs, patents, etc.)*

_____ Financial Measures *(Examples: revenues, gross margins, costs assets, debts, cost reductions, sales improvement, market share, etc.)*

_____ External Customer Satisfaction measures *(Examples: Recipients of research, products, or services OUTSIDE the organization; also consumers.)*

_____ Internal Customer Satisfaction measures *(Examples: Other teams, business units, departments, management, etc. INSIDE the organization.)*

16. How many performance measures are used in this team/project's performance appraisal?

_____

17. On a scale from 0% to 100%, how involved has this team been in the actual design of their performance measurement system?

_____ %

18. On a scale from 0% to 100%, how involved was this team in setting their own measures, goals, and objectives?

_____ %

19. On a scale from 0% to 100%, how involved are team members in the actual appraisal of team/project performance?

_____ %

20. Who are this team/project's performance raters? Check all that apply.

_____ Top Management

_____ Supervisors

_____ Team/Project Leaders

_____ The team itself

_____ Other teams

_____ Individual team members

_____ Internal customers

_____ External customers

_____ Consultants

_____ Consumers

_____ *Others (Please list)*_____

21. How many total performance raters does this team/project have?

_____

22. How often is this team/project's performance appraised either formally or informally?

_____ Never

_____ Irregularly

_____ Annually

_____ Semi-annually

_____ Quarterly

_____ Every 2 months

_____ Monthly

_____ Every 2 weeks

_____ Weekly

_____ At Project Milestones

_____ At Project Progress Meetings;

*How often do these meetings occur?*_____

_____ At Project Completion

_____ *Other (please indicate)*_____

23. What levels of performance feedback are provided? *(i.e. measured performance results, project progress, or relevant information so that individuals can make adjustments in performance)*

_____ Individual level

_____ Team or Project level

_____ Business Unit

_____ Organizational

24. How often is performance feedback provided to the team/project either formally or informally?

_____ Never

_____ Irregularly

_____ Annually

_____ Semi-annually

_____ Quarterly

_____ Every 2 months

_____ Monthly

_____ Every 2 weeks

_____ Weekly

_____ At Project Milestones

_____ At Project Progress Meetings;

*How often do these meetings occur?*_____

_____ At Project Completion

_____ *Other (please indicate)*_____

25. Which types of rewards are dispensed most commonly to this group?

_____ Individual rewards

_____ Team/Project rewards

_____ Business Unit rewards

26. What types of rewards does this team receive?

_____ Financial rewards *(merit raises, bonuses, salary increases, gain-sharing stock, etc.)*

_____ Non-Financial rewards *(recognition, plaques, parties, gift certificates, etc.)*

_____ BOTH Financial and Non-Financial rewards

27. How well does the overall performance measurement system used for this team or project link to the organization's vision or top management's strategy?

0	1	2	3	4
No link	very little	somewhat	greatly	totally

28. Directions: Rate your team or project on the basis of the following: If 100% means the best that your team can do with all its current resources, how well is it actually doing now (write a percentage ranging from 0% to 100%) after each statement).

1 Controlling costs:_____

2 Goal achievement:_____

3 Cycle time:_____

4 Quality of products:_____

5 Innovation:_____

6 Increased capacity:_____

7 Use of expertise on the team:_____

8 Customer satisfaction:_____

9 Quality of service to customers:_____

10 Responsiveness to customer requirements:_____

11 The team's desire to work together in the future:_____

12 The team's satisfaction with one another:_____

13 Problem-solving:_____

14 Decision-making:_____

15 The team's belief in their ability to perform the job:_____

16 Increased sales:_____

17 The team's growth opportunities:_____

18 Trust in management:_____

19 Commitment to the organization:_____

20 The team's satisfaction with the job:_____

APPENDIX B

TUCKMAN'S (1965, 1977) STAGES OF TEAM DEVELOPMENT

STAGES OF TEAM DEVELOPMENT

Directions: Check the one stage of team development that most closely describes this team's current level of functioning.

Forming: *(The group is newly formed, norms have not yet been established, and the group is not yet united.)*

Storming: *(The group is frustrated, angry, confused, uncertain, or afraid over some discrepancy between individual hopes for the group and collective reality.)*

Norming: *(The members understand their roles, have established shared norms, are beginning to value diversity, and are learning to work together and trust each other.)*

Performing: *(The group understands the tasks and purpose, and performs as a team. The members yearn for continued growth and learning.)*

Adjourning: *(The group is separating and going their different ways. The group is in the process of termination.)*

APPENDIX C

ADAPTED VERSION OF BEYERLEIN'S (1996) PERCEPTION OF TEAM PERFORMANCE SCALE

Directions: Rate your work team on the basis of the following: If 100% means the best that your team can do with all its current resources, how well is it actually doing now (write a percentage ranging from 0% to 100% on the line after each statement).

Controlling costs:_____

Goal achievement:_____

Cycle time:_____

Quality of products:_____

Innovation:_____

Increased capacity:_____

Use of expertise on the team:_____

Customer satisfaction:_____

Quality of service to customers:_____

Responsiveness to customer requirements:_____

Desire to work with the team in the future:_____

I am more satisfied with the team than frustrated:_____

Problem-solving:_____

Decision-making:_____

We believe in our ability to perform our job:_____

Increased production:_____

Your growth opportunities:_____

Trust in management:_____

Commitment to the organization:_____

Satisfaction with the job:_____

APPENDIX D

ORGANIZATIONAL CONSENT FORM

TEAM PERFORMANCE MEASUREMENT STUDY
FOR R&D WORK TEAMS

CONSENT FORM

Please complete this consent form. If you have any questions, please contact Koy Roberts @ (940) 565-2671.

Organizational Consent

Organization Name _____

I would like your permission to refer to your company's participation in this Team Performance Measurement Study. This information will be used to publicize this research and to acknowledge participants in final reports and conference presentations. Your organization's name will only be referred to in general terms and not linked to any data. If your company has no objection to such identification, please sign below.

Representative Name _____

Signature _____

Consent - Network Participation

I would like your permission to include your organization in our Project Participant Network Listing. Such a Network will provide participants with future contacts and resources relating to Team Performance Measurement in knowledge work settings. If your organization has no objection as to participation, please sign below and provide an organizational contact.

Representative Name _____

Signature _____

Organizational Contact _____
Address _____
Phone Number _____
Email _____

APPENDIX E

INDIVIDUAL CONSENT FORM

UNIVERSITY OF NORTH TEXAS
TEAM PERFORMANCE MEASUREMENT STUDY FOR R&D WORK TEAMS

CONSENT TO PARTICIPATE FORM

This research project invites you to participate in an investigation of R&D work teams. The study focuses on team performance management practices. I will be working with engineers, scientists, and researchers in technical professional teams. I believe that team measurement and rewards are an important part of improving quality in organizations, but there have been very few scientific studies that investigate how team performance and rewards are related to performance in R&D work teams.

This project will span approximately one year as I investigate, analyze, and report on these performance management practices. During this time we will ask you to work with us to answer a survey about performance management practices and perceptions of effectiveness.

Participation in any part of this investigation is voluntary. Individuals who agree to participate are free to withdraw from the study at any time without penalty, prejudice, or loss of benefits.

The information we collect from you is confidential. We call the information gathered from these methods "raw data." It will only be available to members of our university research group. As we acquire the raw data, it will be changed into coded information for analysis. Coded data will not identify individuals, teams, or organizations by name or through any identifiers. At the conclusion of the study, the raw data will be destroyed. Research publications and educational materials based on coded data will not identify individuals, teams, or organizations' work sites by name unless permission has been obtained in writing.

If you and your organization are willing to participate in this investigation, please sign below.

_____
(Name of your organization)

_____ _____
(Date) (Signature of participant)

_____ _____
(Date) (Signature of project investigator)

If you have questions about the study, please call the research authors at the University of North Texas: Michael Beyerlein, Ph.D. at 940-565-2653 or Koy Roberts at 940-565-2671.

(This project has been reviewed and approved by the UNT Committee for the Protection of Human Subjects 940-565-3940).

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